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The Scale



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IMPORTANT NOTE ABOUT SCALENET

We have been forced to make some changes on the Systematic Entomology Laboratory server and these changes require that the address (URL) of ScaleNet will also need to be changed. It will now be <http://www.sel.barc.usda.gov/scalenet/scalenet.htm>. The change is an addition of "scalenet/" between "gov/" and "scalenet.htm". Sorry for any inconvenience that this will cause. Use of the old URL will take you to a message telling you where to look for ScaleNet.

ISSIS VIII

(Eighth International Symposium on Insect Studies)

The early stages of preparation for the Eighth International Symposium on Insect Studies are well in hand. This is taking place at Wye in South East England between the 31st August and the 6th September 1998. The Third Circular has been sent to all those who had indicated an interest by replying to the Second Circular. The 3rd circular included information on accommodation (all of which will be in the village of Wye), and details regarding payment, registration fees, papers, posters and abstracts, and that no itinerary is currently being planned for non-participants (if I know sufficiently far in advance how many non-participants are going to attend, this may be changed). It also stresses that you should contact me as soon as possible if you need an invitation. The next circular giving precise instructions regarding manuscripts, travel and other details will be sent to you during April, 1998. I would very much like to hear from you all and will need firm commitments by about the end of July. If you have not received the Third Circular and would like further details about this meeting, please do not hesitate to contact me. Please use E-mail as far as possible.

Chris Hodgson, Environment Department, Wye College, (University of London), Wye, Ashford, Kent, TN25 5AH, UK. Tel. No. (+44) (0)1233 812401; Fax. No. (+44) (0)1233 812855. E-mail: c.hodgson@wye.ac.uk or l.sessions@wye.ac.uk

News From Around the World

Editors Note: If you would like to participate in this part of the Scale in 1999, please send an E-mail to Dug Miller at the address given above. If you are unable to use E-mail, a fax or snail mail message will be accepted. Please submit your contribution by January 15, 1999.

From Kay Chadfield, Turners & Growers International, Auckland, NZ.

I have recently changed my job, but am still working as a Quarantine Scientist. I am in the middle of setting up a quarantine laboratory and hope to be identifying my beloved scales and mealybugs hopefully in a month or two. I am getting definite withdrawal symptoms from not being in front of a microscope daily.

From Bill Howard, Department of Entomology, University of Florida, Ft. Lauderdale, USA.

Issue 1. I wanted to know more about the Halimococcidae. I am interested in knowing if the covering produced by this family incorporates the exuviae as suggested by Ferris, Dietz, and others or if it is without the exuviae as suggested by Kohler. If without, is this true of the entire family or just *Colobopyga*? [Editor's note- if you know the answer please contact Bill at fwhoward@icon.fld.ufl.edu.]

Issue 2. Would you please mention our website. <http://www.fld.ufl.edu/cycad.htm>. We post updates on what we are doing about *Aulacaspis yasumatsui* in Miami, show graphics of cycads infested with it, will have a graphic showing the mature female, etc.

From Ray Gill, California Department of Food and Agriculture, Sacramento, USA.

I have not been too active in the area of scale insect research, but you might mention that my armored scale book was published this year. I have done some preliminary work towards getting the mealybug volume ready, but that project is on hold at the moment.

From Evelyn Danzig, Institute of Zoology, St. Petersburg, RUSSIA

My monograph on the mealybugs of Russia etc. continues and will be published in the series "The fauna of Russia and neighboring countries". I have finished the genera *Trionymus*, *Puto*, *Balanococcus* and the complex of species with oral-rim tubular ducts, which are included in *Atrococcus* and *Spilococcus*. Rather than waiting for the completion of the monograph, I have decided to publish some parts separately. *Trionymus* was published in *Zoosystematica Rossica* in December and *Atrococcus* and *Spilococcus* will appear in the spring in *Entomol. Rev.*

I also am working on identifying the scale insects collected in Vietnam by Sugonyaev and in Mexico by Trijapitzin and his wife. Last summer, thanks to Danièle Matile-Ferrero and colleagues of Nat. Hist. Museum in Vienna, I was able to study the collection of V. Signoret. Afterwards, we had a very nice time in Italy thanks to the hospitality of Giuseppina Pellizari. We discussed many coccidological problems in Padova with Giuseppina and her postgraduate student Paolo Comporese and had interesting collecting excursions.

From Chris Hodgson, Environment Department, Wye College (University of London), Wye, Ashford, Kent, UK:

Perhaps the most significant point is that ISSIS VIII is taking place from the 31st August to the 6th September, 1998, at Wye College in Kent, UK. The Third Circular has been E-mailed, faxed or posted to all of you who had replied to the Second Circular. If any of you are interested but have not heard from me, please get in touch as soon as possible at the address below. If it is at all possible, please use E-mail. I am very keen to have workers with a wide range of interests in the general area of scale insects participate in this Symposium, and so please try and come and add

your expertise to the discussions etc.

About six years ago, Yair Ben-Dov was invited to edit a book on soft scales for the World Crop Pests Series published by Elsevier Press. He generously asked me to be co-editor and we have been hard at it ever since! This book had a long gestation period but has now been published as two volumes and is described in more detail by Yair elsewhere in this volume. I would very much like to take this opportunity of thanking all of you who agreed to write chapters - I hope that you have found the finished product useful!

About four years ago I decided to revise the soft scales of New Zealand. Luckily, Rosa Henderson of Landcare Research, Auckland was also interested in revising this group and so it was decided to do it as a joint project. At the time, the New Zealand indigenous fauna was rather poorly known and was considered to be rather depauperate. It had last been studied by Maskell at the end of the last century and, as New Zealand was one of the earliest landmasses to have been budded off Gondwanaland, it was thought that the soft scale fauna might belong to some of the more primitive families. In my earlier redescription of the type species of all genera, the type species of *Ctenochiton* had shown considerable variation (suggesting that there might be several species involved), while *Lecanochiton* and *Inglisia* appeared to be most unusual genera. The fauna of New Zealand, therefore, seemed a worthwhile group to study, especially as the total number of known species was about 17, a number which was considered to be very manageable. However, much material had been collected since Maskell's time, particularly recently by Clare Morales and Rosa Henderson, and it has become clear that 17 is a gross underestimate and that New Zealand is quite speciose, with probably about 50 species by the time we complete our revision. It is also apparent that it is highly likely that all species (and perhaps all genera, including at least two new ones) are probably endemic. *Inglisia* is almost certainly a monotypic genus and all other species presently placed here will have to be moved. In addition, it is felt quite likely that few, if any, of those currently in *Ctenochiton* from elsewhere in the world are congeneric with the type species and they also will probably have to be transferred to other genera.

As far as it is possible, it is intended to describe all stages of all these species, including the adult males. Rosa has been assiduous in collecting adult males and we now have males of about half the known species. A paper on one of the new genera is nearly complete and should be published in 1998, while at least part of this study is expected to be published in the Fauna of New Zealand Series. I shall be spending 2 months in New Zealand in the early part of 1998 and Rosa and I hope to nearly complete this work while I am over there.

About 18 months ago Penny Gullan in Australia sent me an interesting soft scale from New South Wales. It was apparent that this was a new genus and new species. Further work by Penny showed that *Platylecanium cappari* (Froggatt) was congeneric and so we have a joint publication coming out early in 1998 covering these species. In addition, after my visit to New Zealand, I shall be spending a month in Canberra with Penny when Penny and I will be reviewing the soft scales of Australia with the view of eventually redescribing them. It is hoped to produce a series of publications on the Australian fauna, also covering as many stages as are available.

In 1997, Dug Miller sent some slides of an eriococcid from *Nothofagus* in Chile. It is a new genus and species but very close to *Eriochiton* (from New Zealand). A paper is being prepared, yet again emphasizing the extraordinary similarity of Chilean and New Zealand biotas.

From Yair Ben-Dov, Department of Entomology, Institute of Plant Protection, Agricultural Research Organization, The Volcani Center, ISRAEL

The major project carried out in our laboratory is the development of a computerized database of information on the scale insects of the world. When finalized, it will provide data on the systematics, geographical distribution, host plants, biology, ecology and economic importance of the species in all the 21 families of scale insects, as well as a complete database of publications since 1758. It is a joint project with Dr. Douglass R. Miller, Systematic Entomology Laboratory, Beltsville Maryland 20705, USA, and with Dr. Gary Gibson, Biological Resources Division, Agriculture Canada, Ottawa, Ontario. The project is carried out at Bet Dagan by Ben-Dov and assisted by Ms. Viktoria Germam and by Ms. Yulia Bir. The project was funded by the United States - Israel, Binational Agricultural Research and Development (BARD) for the year 1995-1996, and extended for the years 1997-1999. The project was based initially on the computerized databases compiled by Yair Ben-Dov, and were published in the Coccidae and Pseudococcidae Catalogues in 1993 and 1994. These databases have been converted to the new database system named BASIS, upon which the whole project will be based. BASIS was developed by Gary Gibson. A series of queries were developed and placed on the Internet as ScaleNet (<http://www.sel.barc.usda.gov/scalenet/scalenet.htm>). You are encouraged to surf into the ScaleNet site, browse it and make your queries. We look forward to receiving your comments. Currently, three families are available in ScaleNet, the Eriococcidae (developed by Dug Miller and Maren Gimpel), the Conchaspidae (developed by Yair Ben-Dov and Ms. Yulia Bir), and the original unedited version of the Coccidae (developed by Yair Ben-Dov). Here at Bet Dagan, we are working on 'polishing' and proper adjustment of the Coccidae and Pseudococcidae databases, after they were converted (by Gary Gibson and Jennifer Read) to BASIS. We expect to add these families to ScaleNet in the near future. We are also developing the database for the Acleridae, Asterolecaniidae, Beesoniidae, Carayonemidae, Dactylopiidae, part of the Diaspididae, and Lecanodiaspididae, which hopefully will be added to ScaleNet in due course.

In August 1990 I was invited by Prof. Maurice W. Sabelis, Editor-in-Chief of the World Crop Pests series published by Elsevier Science Publishers, Amsterdam, the Netherlands, to edit the book "Soft Scale Insects - their Biology, Natural Enemies and Control". I was advised by Elsevier to suggest a co-editor. Immediately I asked Chris Hodgson (Wye College, University of London, Wye, UK) who happily and willingly accepted the invitation. Forty five of our colleagues kindly agreed to contribute their knowledge and expertise to the 57 sections of the book. The book was finally finished in January 1997, and is being published in two volumes. Volume 7A appeared in October 1997, and Volume 7B in December 1997. Volume 7A (452 pp.) contains 30 chapters on soft scale morphology, systematics, phylogeny, biology, physiology, ecology and techniques, while Volume 7B (442 pp.) contains 27 chapters covering their natural enemies (pathogens, predators and parasitoids) and economic importance on the more important agricultural crops. Both volumes have extensive indexes covering general index, Coccoidea taxa, natural enemies and host plants.

Danièle Matile-Ferrero (Laboratoire d'Entomologie, Museum National d'Histoire Naturelle, Paris, France) and I are working on a taxonomic revision of the mealybugs of the Mediterranean basin. The fauna of this region comprise about 270 species belonging to some 67 genera.

From Tino Russo, Istituto di Entomologia Agraria, via Valdisavoia, Catania, ITALY

Scale insects research that is planned at the Institute of Agricultural Entomology, (Santi Longo, Gaetana Mazzeo and myself) for the next several years, is as follows: 1) taxonomy and faunistics of the scale insects in Sicily, particularly mealybugs and soft scales; 2) development of monitoring procedures for *Planococcus citri* in Italian citrus-groves; monitoring models for *Planococcus citri* in citrus groves; evaluation of changes in population density after application of mass-trapping of mealybugs populations; use of kairomone to select exotic natural enemies to improve biological control, using pheromone from the same scale insect species; evaluation of the effect of inundative release of natural enemies on damage caused by the mealybug in citrus orchards (E.U. project together with colleagues of France, Israel, Spain and Portugal); 3) integrated control in citrus groves: biological control of mealybugs and armored scale, development of forecasting models of *Aonidiella aurantii*.

From Paris Lambdin, University of Tennessee, Knoxville, USA

We recently completed a study on a major outbreak of the oak eriococcin in a northern red oak seed orchard where 49% of the 787 trees in the plantation were lightly to heavily infested. We are in the process of preparing a manuscript on the project at this time. We also are continuing our work on assessing the wings of male scale insects and the diversity of scale insects in Tennessee. We are still collecting dry or slide material of any male scale species. If anyone has material we could borrow, we would deeply appreciate looking at it.

Christof Stumpf continues to progress in his effort to described and illustrate the asterolecaniids of the Neotropical region. In addition, he is evaluating the biogeography and host range for the pit scales and has developed a cladistic analysis of the family members based on the external morphological characters of the adult females.

From Jan Koteja, Institute of Applied Zoology, Krakow, POLAND

Even electronically it would be difficult to send greetings to all Members of the Coccid Society; as its Secretary, please take my hearty wishes for Christmas and the coming New Year to all of them.

From Michael Kosztarab, Department of Entomology, Virginia Polytechnic Institute and State University, Blacksburg, USA

My old-time dream came true last spring when the Annual Review of Entomology published the article on adaptations in scale insects, co-authored with Penny Gullan.

Most of my free time this year was spent in finalizing and overseeing the printing of my autobiography, Transylvanian Roots. Getting the 105 illustrations together, including ten home-made maps, as well as a 20-page subject index, took some effort, but I hope it was not in vain. So far, all the printed book reviews have been complimentary. Some coccidologists will discover their names in the index, as well as their 10- or 25-year old photographs, from a time when they looked even better than now.

My wife lured me to accompany her on a southern Iberian trip last April. So, for the first time, I had a chance to collect scales in Portugal and found at least one species new to their fauna.

Dug Miller transported most of my donated scale library to his office, and after selecting those items that were additions to the USDA/NMNH collection, he forwarded the rest to Paris Lambdin

to complement his library. I had already given Paris my collection of coccidologists' photographs. Paris, to my delight, continues training future young coccidologists and has already attracted a number of international students/scientists to his laboratory.

Because I don't have a laboratory, but only a small office on the fifth floor of our building, I can no longer host visiting scientists or advise graduate students. Matilda has set up a computer in our home where I can now receive email messages at mkoszt@vt.edu.

Our scale insect collection included as part of an insect collection of over one million specimens, is housed in the Virginia Tech Natural History Museum building, and I am still serving as curator. No systematist has been hired in the last five years to take over this and other responsibilities.

We tried to get our last green research bulletin printed on the revision of *Sphaerococcinae* mealybugs. This was Dr. Harlan Hendricks' dissertation, my last Ph.D. student. Unfortunately our school will publish it only electronically. Therefore, no more scale insect bulletins are expected to be issued in paper form from our university. Harlan's dissertation is to be printed in Europe in the series *Das Tierreich*.

Karen Veilleux continues her scale literature project. She is working with Dug Miller, Yair Bendov, and associates, on ScaleNet, the web catalog of worldwide scale insects. The list of recent literature included in this issue of the *Scale*, reflects the more current papers added to ScaleNet during this past year.

Coccidologists who received a questionnaire from me on the status of manpower in coccidology for their geographic area, are reminded to complete and return these to me. If you did not receive one, and would like to participate, please let me know. I am looking forward to seeing you and reporting on the status of manpower at the ISSIS-VIII in Wye, next September.

With best wishes for the New Year.

From Dug Miller and the Beltsville gang, Systematic Entomology Lab., Maryland, USA

Our primary project is ScaleNet and this project has been described in detail by Yair and won't be repeated here. For this project, Maren Gimpel is doing the majority of the work and has entered data information in the database for the Eriococcidae, Ortheziidae, Kermesidae, Halimococcidae, Cerococcidae, Phenacoleachidae, and Phoenicococcidae. We currently are in the process of revising the ScaleNet query software and updating and adding new families to the web site. This project is being done through a contract with Richard Carson and Associates. Gary Gibson and Jennifer Read of Agriculture Canada have developed and implemented a series of enhancements for the BASIS program. Karen Veilleux has entered an enormous amount of new bibliographic information that soon will be available through ScaleNet. Some of that data is part of this number of "The Scale." We currently are working on a manuscript on the Eriococcidae Catalog which will be the first major hard-copy product from the project. Other research that is in the process of being completed or is in press is a paper on gall forming mealybugs with Doug Williams, a paper on *Ortheziola* and a paper on Afrotropical *Newsteadia* with Ferenc Kozár, a paper on two South American eriococcids with Chris Hodgson, a biological study with Sridhar Polavarapu and John Davidson on *Diaspidiotus ancylus*, description of a new species of economic armored scale with John Davidson, continuation of the book on economic armored scales of the US, a paper on the current placement of the species previously considered to be in the genus *Sphaerococcus*, and redescription of an obscure eriococcid from South America with Doug Williams.

Participants of ISIS-VIII

Autographed copies of two recent books: *Scale Insects of Northeast North America* and *Transylvanian Roots* will be available from Michael Kosztarab to participants of ISIS-VIII who preordered these from him by May 15. Address: Michael Kosztarab, 614 Woodland Dr., Blacksburg, VA 24060, USA. Research bulletins on scale insect studies from Virginia Tech can also be preordered for personal delivery at Wye. For price information please contact Michael. He is giving a special discount.

Book Review by Karen Veilleux: The Autobiography of a Favorite Colleague

Transylvanian Roots: The True Life Adventures of a Hungarian American by Michael Kosztarab. Illustrated by Zoltán Albert. Blacksburg, VA: Pocahontas Press, 1997. 224 pp. (softcover).

Those of us who know and appreciate Michael Kosztarab understand that he has already accomplished a great deal in his life, both professionally and personally, and have no doubt of his capabilities. But the recent appearance of his autobiography reveals a new accomplishment: the ability to reflect and share his perspective on the ongoing history of his life. He accomplishes this in his energetic, matter-of-fact and persistently upbeat style.

Throughout the horrendous events of religious and ethnic persecution, invasions, toppled governments, and political upheavals surrounding his early years in tumultuous Transylvania, he manages not only to dream of a better life, but to hold onto his dream until he finds a way to make it come true. He treats us to the details of his life as a small child in Romania and Hungary, then as a young man moving through the unpredictable times of war-torn Eastern Europe. In those days he worked as a construction worker, floriculturist, extension horticulturist, entomologist, and professor, responding to whatever the situation allowed or required. We learn the harrowing story of his and his wife's escape from Communist Hungary, and the even more harrowing story of how he arranged for his infant daughter to be smuggled across the border to join them. Later, as an immigrant to the New World, he maintained his optimistic outlook. On numerous occasions when others might have been overwhelmed by the odds against them, he managed to attract the help he needed to obtain a car, a job, an apartment and, eventually, to become successful in his career.

In the middle and later years of his professional career, he found the opportunity to travel to Asia, Australia, Costa Rica, Israel, Italy, Mexico, and Sri Lanka, where he increased his scale collection and shared his knowledge. His discussions in this part of the book reflect not only his increasing connections to the international community of entomological researchers but also his growing contributions to the creation and strengthening of that community, through his participation in conferences and face-to-face meetings with other members. On a personal level, too, it is obvious to the reader that Michael has never forgotten those who have assisted him along the way, reciprocating

when he had the opportunity and supporting other newcomers to his profession or community.

Another recurring theme is Michael's continuing love for his homeland and the people with whom he spent his early years. Although displaced long ago, he has returned repeatedly to visit family, friends and reconnect with his ethnic heritage. His book offers descriptions of these return visits to Transylvania, and are a treat for those of us for whom this region is an unknown mystery.

"Transylvanian Roots" serves as an inspiration and education to those of us in earlier stages of our careers and lives, as well as an opportunity to reflect upon fragments of our own histories, provoked by Michael's recounting of his.

RECENT LITERATURE

By Karen Veilleux

[Editor's note: As usual, Karen has done a wonderful job of searching, recording, and abstracting the literature on the Coccoidea. She is very careful and exacting and deserves special thanks from the scale insect community for her dedication to this task.]

Abou-Elkhair, S.S., Abou-Elkhair, K.S., Elsetrawy, A.A. & Sami, M. 1997. Effect of potassium and va-mycorrhizae on the infestation by the soft scale insect (*Pulvinaria psidii* Mask) and growth of *Schinus terebenthifolius* seedlings. Proceedings of the XI World Forestry Congress 1: 205.

Notes: [Conference held on 13-22 October 1997, Antalya.]

Almeida, L.M. & Carvalho, R.C.Z. 1996. A new species of *Ayza* Mulsant from Brazil (Coleoptera, Coccinellidae) feeding on *Pulvinaria paranaensis* Hempel (Homoptera, Coccidae) on *Ilex paraguariensis* St. Hil. (Aquifoliaceae). Revista Brasileira de Zoologia 13: 643-645.

Notes: This new species found feeding voraciously on *Pulvinaria paranaensis* from *Ilex paraguariensis*, an important crop in southern Brazil; several other scales are also hosts of *Ayza*.

Almeida, L.M. de & Vitorino, M.D. 1997. A new species of *Hyperaspis* Redtenbacher (Coleoptera: Coccinellidae) and notes about the life habits. Coleopterists Bulletin 51: 213-216.

Notes: *Hyperaspis delicata* sp. nov. from Brazil, is described and illustrated. Brief biological notes are given. Larvae of *H. delicata* sp. nov. feed on Eriococcidae inside galls of *Psidium cattleianum* where they finish development. Adults emerge from the gall through a small hole.

Amin, A.H. & Emam, A.K. 1996. Relative susceptibility of three grape vine varieties to infestation with *Maconellicoccus hirsutus* (Green). Ann. Agricultural Science 41: 493-500.

Notes: Eight morpho-histological characters were used to evaluate the relative susceptibility of 3 grapevine varieties to infestation by *M. hirsutus*.

Barbier, R., Le Lannic, J. & Brun, J. 1996. [Sensory receptors of maxillary palps of adult aphidiphagous, coccidiphagous and phytophagous coccinellids.] Récepteurs sensoriels des palpes maxillaires de Coccinellidae adultes aphidiphages, coccidiphages et phytophages. (In French with summary in English). Bulletin de la Société Zoologique de France 12: 255-268.

Notes: General discussion of scale hosts but no species mentioned.

Bastien, Y 1997. [A discussion of silvicultural treatments of beech in open, mixed high stands.] Pour l'éducation du hêtre en futaie claire et mixte. (In French). Revue Forestière Française 49: 49-68.

Notes: Many beech (*Fagus sylvatica*) forests in France are currently dense, even-aged, monospecific stands which lead to (1) poor ecological health - e.g., susceptibility to wind damage, pathogenic fungi and insect pests such as *Cryptococcus* sp., beech scale; and (2) poor economic return.

Battaglia, D., Tranfaglia, A., Franco, J.C. & Carvalho, C.J. 1997. *Leptomastix dactylopii* Howard (Hymenoptera, Encyrtidae) fecundity and innate capacity for increase under the laboratory controlled conditions. Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'. Portici 52: 3-11.

Notes: *L. dactylopii* is an effective biological control agent of *Planococcus citri* found on citrus and ornamental plants.

Beardsley, J.W. 1997. 1.3.2 Gall formation. Pp. 337-338. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Gall-forming species have been described in eight major families of Coccoidea; of the more than 160 species of obligatory gallicolous Coccoidea, only *Cissococcus fulleri* produces plant galls.

Beardsley, J.W. 1997a. Hawaiian Pseudococcidae (Hemiptera): A group that Perkins missed. Pacific Science 51(4): 377-379.

Notes: Among the 16 or so recognized families of Coccoidea, only Pseudococcidae and the small, specialized Halimococcidae are represented in the endemic Hawaiian fauna. Why other large coccoid families failed to establish there is unknown. The endemic Pseudococcidae of Hawai'i currently include 31 described species in 13 genera. Ten genera are endemic. Around 40 undescribed endemic mealybug species belonging to both described and undescribed genera also are known.

Ben-Dov, Y. 1997. Chapter 1.1. Morphology, systematics and phylogeny. 1.1.1 diagnosis. Pp. 3-4. in: Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam and New York. 452 pp.

Notes: Definition and general characteristics of the Coccidae family; word translated into six languages.

Ben-Dov, Y. & Hodgson, C.J. 1997. Soft Scale Insects - Their Biology, Natural Enemies and Control. Elsevier, Amsterdam & New York. 452 pp.

Notes: Part of series: World Crop Pests, 7A. This volume covers morphology of adult female, male, immature stages, the male test, internal anatomy of adult female, and ultrastructure of integumentary glands; also, taxonomic characters of the adult

female, adult male, nymphs, classification of coccidae and related coccoid families, intraspecific variation of taxonomic characters, zoogeographical considerations and status of knowledge of the family, and phylogeny; biological information includes general life history, embryonic development; oviparity and viviparity, endosymbionts, morphology and anatomy of honeydew eliminating organs, and sooty moulds; discussion on soft scales as beneficial insects; ecological discussions on effects on host plants, gall formation, crawler behaviour and dispersal, seasonal history and diapause, relationships with ants, and encapsulation of parasitoids; techniques discussed cover collecting and mounting, and laboratory and mass rearing; includes index to Coccoidea taxa, index to names of pathogens, predators and parasitoids, and index to names of plants.

Ben-Dov, Y. & Hodgson, C.J. 1997a. Soft Scale Insects - Their Biology, Natural Enemies and Control. Elsevier, Amsterdam & New York. 442 pp.

Notes: Part of series: World Crop Pests, 7B. This volume covers entomopathogenic fungi, Coccinellidae and other Coleoptera, Cecidomyiidae and other Diptera, Encyrtidae, and Aphelinidae as natural enemies of Coccidae, economic importance of Coccidae, insect development and reproductive disrupters, biological control, coccid pests of citrus, olive, avocado, mango, guava, persimmon, other subtropical fruit trees, deciduous fruit trees, grapevine, sugarcane and bamboo, coniferous forest trees, deciduous forest trees, ornamental and house plants, coffee, cocoa, tea, coconut and rubber.

Ben-Dov, Y. & Hodgson, C.J. 1997b. 1.4 Techniques. 1.4.1 Collecting and mounting. Pp. 389-395. in: Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Detailed suggested techniques for preservation, storage, remounting old slides, and mounting and staining of adult males.

Ben-Dov, Y., Hodgson, C.J. & Miller, D.R. 1997. Changes and comments on the taxonomy and nomenclature of some taxa in the families Coccidae, Eriococcidae and Pseudococcidae (Homoptera: Coccoidea). *Phytoparasitica* 25: 199-206.

Notes: Catalogues of soft scale insects (Coccidae), felt scales (Eriococcidae) and mealybugs (Pseudococcidae) are being placed on the World Wide Web; this article validates several taxonomic and nomenclatural changes in taxa referring to: *Cardiococcus major*, new comb. and change of rank, *Ceronema iceryoides*, *Ceronema koebeli*, *Eulecanium tiliae*, *Maacoccus*, *Neoplatylecanium tripartitum*, *Neosaissetia*, *Parthenolecanium persicae*, *Podoparalecanium*, *Saccharipulvinaria*, *Taiwansaissetia*, *Toumeyella pini*, *Udinia lamborni*, *Apezococcus idiaestes*, *Eriochiton spinosus*, *Lenania africana*, new comb., *Phenacoccus halli* and *Pseudococcus pipturicolus*.

Bermuda, Department of Agriculture and Fisheries 1997. Unwelcome visitors to the island at Christmas. Monthly Bulletin (Department of Agriculture, Fisheries & Parks, Bermuda) 68: 8 pp.

Notes: Species mentioned include *Chionaspis pinifoliae*.

Bertschy, C., Turlings, T.C.J.; Bellotti, A.C.; Dorn, S. 1997. Chemically-mediated attraction of three parasitoid species to mealybug-infested cassava leaves. *Florida Entomologist* 80: 383-395.

Notes: We investigated whether cassava plants that are infested by the cassava mealybug, *Phenacoccus herreni* (Pseudococcidae, Sternorrhyncha), emit attractants for the encyrtid parasitoids *Aenasius vexans*, *Apoanagyrus (Epidinocarsis) diversicornis*, and *Acerophagus coccois*. Bioassays with a Y-tube olfactometer showed for all three species that female wasps were most responsive and selective when they were 1.5 to 2.5 days old. Females of these age groups were used to test their ability to distinguish between the odor of plants with and without mealybugs. The wasps were offered choices between infested cassava leaves vs. healthy ones, infested leaves vs. clean air, and healthy leaves vs. clean air. *A. vexans* and *A. diversicornis* were strongly attracted to infested leaves and preferred these over healthy ones. In contrast, *A. coccois* was significantly attracted to either healthy or infested leaves, and did not distinguish between the two. The results suggest that *A. coccois*, which has the broadest known host range of the three, may be responsive only to general plant odors, while *A. vexans* and *A. diversicornis* respond more specifically to odors associated with mealybug infestation.

Bhattacharya, A., Sharma, K.K., Sushil, S.N., Jaiswal, A.K. & Mishra, Y.D. 1996. *Paecilomyces* sp. on lac insect predator, *Eublemma amabilis* Moore (Lepidoptera: Noctuidae): a first record. *Insect Environment* 2: 57-58.

Notes: During an extensive survey in Bihar, India, during the rainy season of 1995, larvae of *Eublemma amabilis* a serious predator of *Kerria lacca*, were observed to be infected by *Paecilomyces* sp.

Bhuiya, B.A., Chowdhury, S.H. & Kabir, S.M.H. 1997. An annotated list of chalcidoid parasitoids (Hymenoptera) of Coccoidea (Homoptera) on guava in Bangladesh. *Bangladesh Journal of Zoology* 25: 53-63.

Notes: 41 species of parasitoids from 22 genera and 5 families (Encyrtidae, Aphelinidae, Eulophidae and Mymaridae) belonging to the superfamily Chalcidoidea were collected and identified from coccoid hosts infesting guava in Bangladesh. Of them, 28 species are new records from Bangladesh. The species include two new to science and descriptions of two new species are being prepared for publication elsewhere. Worldwide distribution, brief notes on biology and possible utilization in biological control of some species are also discussed.

Blumberg, D. 1997. Parasitoid encapsulation as a defense mechanism in the Coccoidea (Homoptera) and its importance in biological control. *Biological Control* 8: 225-236.

Notes: Coccidae, Pseudococcidae and Diaspididae and their parasitoids (with references to literature documenting them) include *Ceroplastes floridensis*, *Coccus capparidis*, *C. hesperidum*, *C. pseudomagnoliarum*, *C. viridis*, *Parasaissetia nigra*, *Milviscutulus mangiferae*, *Protopulvinaria pyriformis*, *Pulvinaria urbicola*, *Saissetia coffeae*, *S. oleae*, *Pseudococcus calceolariae gahani*, *P. longispinus*, *P. maritimus*, *P. cryptus*, *Planococcus citri*, *P. vovae*, *P. ficus*, *Phenacoccus gossypii*, *P. solani*, *P. manihoti*, *P. herreni* and *Aonidiella aurantii*.

- Blumberg, D. 1997a. 1.3.6 Encapsulation of parasitoids. Pp. 375-387. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
- Notes: Discussion of factors affecting encapsulation incidence; effect of host age, host strain, host's physiological condition, superparasitism, and the host plant; host species include *Ceroplastes floridensis*, *Coccus hesperidum*, *Parasaissetia nigra*, *Protopulvinaria pyriformis*, *Pulvinaria urbicola*, *Milviscutulus mangiferae*, *Saissetia coffeae* and *S. oleae*.
- Blumberg, D., Gross, S., Steinberg, S., Carvalho, C.J., Franco, J.C. & Mendel, Z. 1997. Biological control of the citrus mealybug (Homoptera: Pseudococcidae) in outdoor crops - still a challenge. 11th International Entomophagous Insects Workshop
- Notes: Conference held on July 12-16, 1997 in Madison, Wisconsin; more than 60 species of natural enemies were recorded from *Planococcus citri*; discussion of reasons for inefficient control by these enemies.
- Blumberg, D., Wysoki, M. & Hadar, D. 1996. Parasitoid encapsulation as an obstacle for successful biological control of the pyriform scale, *Protopulvinaria pyriformis* in avocado. World Avocado Congress III: 53.
- Notes: Conference held Oct. 22-27, 1995 in Tel Aviv, Israel; rates of encapsulation of eggs of *Metaphycus stanleyi* under both greenhouse and field conditions; seasonal variation; variation according to ambient temperature; variation according to host plant.
- Borowka, R., Hummel, H.E. & Neuenschwander, P. 1996. Impact of various biological control agents directed against the cassava mealybug *Phenacoccus manihoti* Matile-Ferrero (Hom., Pseudococcidae) under conditions favouring high pest infestations in Malawi. Mededelingen Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent 61(3B): 1019-1024.
- Notes: Biological control of this mealybug primarily by exotic wasp *Apoanagyrus (Epidinocarsis) lopezi*; other enemies include *Exochomus troberti* and *Diomus hennesseyi*.
- Brink, D.T. 1997. A parasitic wasp without a name. Neltropika Bulletin No. 296S: 34.
- Notes: A parasitoid of *Cribrolecanium andersoni* was identified as *Neastymachus dispar*.
- CAB International. 1996. *Aonidiella aurantii*. Distributions Maps of Pests, Series A, Agricultural Map no. 2 (rev.): 5 pp.
- Notes: Published in the U.K. by the International Institute of Entomology, an agency of CAB International; Map showing distribution of this sp. worldwide; countries listed with references to records; host plants include *Citrus* spp., various deciduous fruit trees, wide range of shrubs and palms.
- CAB International. 1996a. *Pseudaulacaspis pentagona*. Distribution Maps of Pests, Series A, Agricultural Map no. 58 (2nd rev.): 5 pp.
- Notes: Published in the U.K. by the International Institute of Entomology, an agency of CAB International; map showing distribution of this sp. worldwide; countries listed with references to records; polyphagous pest; hosts include peaches, apricots, kiwifruits, mulberries, various fruit trees and ornamentals.

CAB International 1997. *Maconellicoccus hirsutus*. Distribution Maps of Pests, Series A, Agricultural Map no. 100, (2nd rev.): 2 pp.

Notes: Published in the U.K. by the International Institute of Entomology, an agency of CAB International; map showing distribution of this sp. worldwide; countries listed with references to records; pest of cotton, *Hibiscus* spp., *Boehmeria*, mulberry (*Morus* spp.), jute (*Corchorus* spp.), and grapevine (*Vitis* spp.).

CAB International 1997a. *Aonidiella citrina*. Distribution Maps of Pests, Series A, Agricultural Map no. 349 (1st rev.): 2 pp.

Notes: Published in the U.K. by the International Institute of Entomology, an agency of CAB International; map showing distribution of this sp. worldwide; countries listed with references to records; pest of *Citrus*, *Prunus*, and tea.

Campbell, C.A.M. 1997. 3.3.15 Cocoa Pp. 381-385. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Coccid pests recorded on cocoa include *Anthococcus keravatae*, *Ceroplastes destructor*, *C. floridensis*, *C. quadrilineatus*, *C. lamborni*, *C. theobromae*, *C. toddaliae*, *Ceroplastodes bahiensis*, *C. metzeri*, *Coccus hesperidum*, *C. longulus*, *C. viridis*, *Cribrolecanium andersoni*, *Drepanococcus chiton*, *D. virescens*, *Etiennea cacao*, *E. gouligouli*, *Eucalymnatus tessellatus*, *Hemilecanium theobromae*, *Inglisia theobromae*, *Lagosinia aristolochiae*, *Milleriococcus costalimai*, *Parasaissetia nigra*, *Philiphedra broadwayi*, *Pulvinaria cacao*, *Pulvinarisca jacksoni*, *Saissetia hurae*, *Udinia catori*, *U. farquharsoni* and *Vitrococcus conchiformis*; geographic distribution; ecology.

Carnegie, A.J.M. 1997. 3.3.10 Sugarcane and bamboo. Pp. 333-341. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Notes on significant pests, *Saccharipulvinaria iceryi*, *S. elongata*, *S. saccharia*, *Coccus guerinii* and *Saccharolecanium krugeri*; other scales recorded on sugarcane and bamboo listed in tables; host plants; distribution; references.

Chakravarthy, A.K., Shivanandam, V.N. & Venkatesh. 1996. Insects associated with an introduced oilseed tree in Bangalore, Karnataka, South India. Insect Environment 2: 67.

Notes: Unspecified mealybugs, among other insects, were found on this host, *Simarouba glauca*.

Chakupurakal, J., Markham, R.H., Neuenschwander, P., Sakala, M., Malambo, C., Mulwanda, D., Banda, E., Chalabesa, A., Bird, T. & Haug, T. 1996. Biological control of the cassava mealybug, *Phenacoccus manihoti* (Homoptera: Pseudococcidae), in Zambia. International Institute of Tropical Agriculture, Research Highlights Report No. 12: 19-25.

Notes: The impact of biological control programs for the control of this species in Zambia; during 1984-89, a total of 54 releases of natural enemies made; *Epidinocarsis lopezi* (*Apoanagyrus lopezi*) was the only one that became established.

- Chua, T.H. 1997. 3.3.17 Coconut. Pp. 393-394. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Coccid species recorded on coconut include *Ceroplastes actiniformis*, *C. rubens*, *C. rusci*, *Coccus acutissimus*, *C. discrepans*, *C. hesperidum*, *C. longulus*, *C. viridis*, *Eucalymnatus tessellatus*, *Milviscutulus mangiferae*, *M. pilosus*, *Neosaissetia triangularum*, *Paralecanium cocophyllae*, *P. milleri*, *Parasaissetia nigra*, *Platylecanium cocotis*, *Saissetia coffeae*, *S. lutea*, *S. miranda*, *S. zanzibarensis* and *Vinsonia stellifera*.
- Chua, T.H. 1997a. 3.3.18 Rubber. Pp. 395-399. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Coccid pests recorded on rubber in Malaysia include *Megapulvinaria maxima*, *Parasaissetia nigra*, *Lepidosaphes cocculi*, *Pinnaspis aspidistrae*, *Chionaspis dilatata*, *Planococcus citri*, *Ferrisia virgata*, *Tachardia* sp., *Laccifer greeni* and *Icerya* sp.; natural enemies and control.
- Cividanes, F.J. & Gutierrez, A.P. 1996. Modeling the age-specific per capita growth and reproduction of *Rhizobius lophanthae* (Col. Coccinellidae). *Entomophaga* 41: 257-266.
- Notes: A per capita model for the growth, development and reproduction of the coccinellid predator *Rhizobius lophanthae* (Blaisd) feeding on the oleander scale (*Aspidiotus nerii* Bouche (Homoptera: Diaspididae)) was developed.
- Coffee Research Foundation, Entomology Section 1996. Technical Circular No. 62. Control of fried egg scale (*Aspidiotus* sp.) and cottony scale (*Icerya pattersoni* Newts) in coffee (revised 1996). *Kenya Coffee* 61: 2175-2176.
- Notes: Incidence and symptoms of attack; biology; natural enemies; chemical control recommendations.
- Conway, J.R. 1997. Foraging activity, trails, food sources and predators of *Formica obscuripes* Forel (Hymenoptera: Formicidae) at high altitude in Colorado. *Pan-Pacific Entomologist* 73: 172-183.
- Notes: *Formica obscuripes* was studied at high altitude in Colorado by marking workers and flagging trails. Seventeen mounds had trails going to a Douglas fir tree (*Pseudotsuga* sp.). Ants also tended treehoppers (Membracidae), scale insects (Coccidae), mealybugs (Pseudococcidae) and galls on plants.
- Csoka, G. 1997. Increased insect damage in Hungarian forests under drought impact. *Biologia (Bratislava)* 52: 159-162.
- Notes: Includes discussion on *Kermes quercus*.
- Cui, S.Y., Zhao, Y.M. & Qi, Z.G. 1997. Study on persimmon scales and its control. (In Chinese). *Forest Research* 10: 514-518.
- Notes: 6 species of persimmon scales are found in the suburbs of Shijiazhuang City: *Eriococcus kaki*, *Eupulvinaria citricola*, *Paraceroslegia japonica*, *Ceroplastes ceriferus*, *Drosicha cerpleata*, *Parthenolecanium persicae*. *E. kaki* and *E. citricola* are dominant, the latter is newly recorded in China; study of the life cycle of the scales; best control period determined; discussion of utilization of natural enemies.

Danzig, E.M. 1996. New species of Coccinea and Aleyrodinea (Homoptera) in the fauna of Vietnam. *Entomological Review* 75: 131-140.

Notes: 15 species of scale insects listed are new to Vietnam. New localities are recorded for 14 species already known. *Diaspis exporosus* is described as new species. Species listed include *Drosicha maskelli*, *D. mangiferae*, *Xylococcus japonicus*, *Maconellicoccus hirsutus*, *Planococcus citri*, *P. lilacinus*, *P. minor*, *Pseudococcus cryptus*, *Acanthococcus bambusae*, *Ceroplastes ceriferus*, *C. floridensis*, *C. pseudoceriferus*, *C. rubens*, *Coccus celatus*, *C. formicarii*, *C. hesperidum*, *Eucalymnatus tessellatus*, *Maacoccus bicruciatatus*, *Megalocryptes bambusicola*, *Pulvinaria psidii*, *Saissetia coffeae*, *S. neglecta*, *S. nigra*, *Achionaspis hainanensis*, *Aspidiotus destructor*, *Neoguernaspis takagii*, *Lepidosaphes euryae*, *Odonaspis secreta* and *Pseudalacaspis cockerelli*.

Danzig, E.M. 1997. 1.1.3.5 Intraspecific variation of taxonomic characters. Pp. 203-212. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Discussion of variability of morphological characters, reproduction, and seasonal development in *Parthenolecanium corni*; intraspecific variability in populations of the cottony vine scale, *Pulvinaria vitis*; other species mentioned include *Chloropulvinaria floccifera*, *Coccus hesperidum*, *C. pseudomagnoliarum*, *Eulecanium douglasi*, *Eulecanium franconicum*, *E. paucispinosum*, *E. tiliae*, *Eupulvinaria peregrina*, *Lecanium corni* var. *robinarum*, *Lepidosaphes ulmi*, *Parthenolecanium corni orientalis*, *P. persicae*, *P. quercifex*, *P. pruinsum*, *P. cerasifex*, *P. putmani*, *P. corni apuliae*, *Pulvinaria crassispina*, *P. vitis* and *Saissetia coffeae*.

Danzig, E.M. 1997a. Species of the genus *Trionymus* from Russia and neighbouring countries (Homoptera, Coccinea: Pseudococcidae). *Zoosystematica Rossica* 6: 95-114.

Notes: Key and annotated list of 26 species of *Trionymus* presented; 10 little known species redescribed and illustrated; host plants; distributions; *T. aberrans*, *T. isfarensis*, *T. implicatus*, *T. kirgisicus*, *T. hamberdi*, *T. kurilensis*, *T. boratynskii*, *T. ferganensis*, *T. mongolicus*, *T. clamagrostidis*, *T. placatus*, *T. perrisii*, *T. phalaridis*, *T. tomlini*, *T. vaginatus*, *T. multisetiger*, *T. iridis*, *T. multivorus*, *T. newsteadi*, *T. artemisiarum*, *T. levis*, *T. turgidus*, *T. parvaster*, *T. dilatatus*, *T. copiosus* and *T. subterraneus*.

Danzig, E.M. & Miller, D.R. 1996. A systematic revision of the mealybug genus *Trabutina* (Homoptera: Coccoidea: Pseudococcidae). *Israel Journal of Entomology* 30: 7-46.

Notes: The genus *Trabutina* includes five species: *T. crassispinosa*, *T. elastica*, *T. mannipara*, *T. serpentina* and *T. tenax*; all occur in arid zones of the Palearctic and are restricted to *Tamarix*; distributions; new synonymy; recommendations for biological control of *Tamarix*.

Darvas, B. 1997. 3.2.1 Insect development and reproduction disrupters. Pp. 165-182. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Discusses neurotoxic zoocides, insect behaviour-modifying chemicals, insect

development and reproduction disrupters (IDRDs) and chemical interfering with hormonal regulation; scale species demonstrating lethal effects of these techniques include *Ceroplastes ceriferus*, *C. floridensis*, *C. japonicus*, *Coccus hesperidum*, *Parthenolecanium corni*, *Physokermes inopinatus*, *Protopulvinaria pyriformis*, *Saissetia coffeae*, *S. oleae* and *Sphaerolecanium prunastri*.

DeLoach, C.J., Gerlind, D., Fornasari, L., Sobhian, R., Myartseva, S., Mityaev, I.D., Lu, Q.G., Tracy, J.L., Wang, R., Wang, J.F., Kirk, A., et al 1996. Biological control programme against saltcedar (*Tamarix* spp.) in the United States of America: Progress and problems. Proceedings of the 9th International Symposium on Biological Control of Weeds, Stellenbosch, South Africa, 19-26 January 1996. 253-260.

Notes: Additional authors: Pemberton, R.W., Chikatunov, V., Jashenko, R.V., Johnson, J.E., Zheng, H., Jiang, S.L., Liu, M.T., Liu, A.P. & Cisneroz, J. Invading saltcedar (*Tamarix romosissima* (*T. chinensis*)) from central Asia has become the most damaging weed of native riparian ecosystems of the western USA. *Trabutina mannipara* has been imported from Israel and is awaiting approval for release on this weed to evaluate possible biological control.

Dejean, A. & Matile-Ferrero, D. 1996. How a ground-dwelling forest ant species favors the proliferation of an endemic scale insect (Hymenoptera: Formicidae; Homoptera: Stictococcidae). Sociobiology 28: 183-195.

Notes: *Anoplolepis tenella* has been found to be a pest permitting the dissemination of *Stictococcus vayssierei* in manioc fields in southern Cameroon, especially when forest litter is not destroyed.

Delalibera, J.I., Humber, R.A., Bento, J.M.S. & Matos, A.P.D. 1997. First record of the entomopathogenic fungus *Neozygites fumosa* on the cassava mealybug *Phenacoccus herreni*. Journal of Invertebrate Pathology 69: 276-278.

Notes: Study of *N. fumosa* as a potentially significant biocontrol agent of *P. herreni*; infection levels, size of hyphal bodies, etc.

Dhileepan, K. 1996. Parasitoids and predators of insects associated with oil palm (*Elaeis guineensis* Jacq.) in India. Elaeis 8: 64-74.

Notes: Survey of oil palm nurseries and plantations in India; 57 species of natural enemies of insects were recorded; these included 24 species of parasitoids, 17 species of predatory insects and 16 species of spiders (Araneae); the role of these parasitoids and predators in naturally suppressing populations of limacodids, psyllids and diaspids is highlighted; scale insects recorded as hosts include *Pinnaspis aspidistrae*, *Asidiotus destructor*, *Chrysomphalus aonidum*, *Hemiberlesia palmae*, *H. lataniae*, *Dysmicoccus brevipes*, *Pseudococcus citriculus*, *Icerya aegyptiaca*, *I. formicarum*, *I. menoni*, *I. seychellarum*, *Coccus accutissimus*, *C. hesperidum*, *Eucalymnatus tessellatus* and *Ceroplastes* spp.

Dixon, A.F.G., Hemptinne, J.L. & Kindlmann, P. 1997. Effectiveness of ladybirds as biological control agents: patterns and processes. (In English with summary in French). Entomophaga 42: 71-83.

Notes: Aphidophagous species of ladybirds (Coccinellidae) have generally proved ineffective biocontrol agents, whereas many coccidophagous species have proved

very effective, especially *Rodolia cardinalis*. Two hypotheses have been proposed to account for this pattern: the optimum food utilization/satiation hypothesis and the generation time ratio hypothesis. In this paper the extensive literature on ladybirds is used to test these hypotheses.

Dubeler, A., Voltmer, G., Gora, V., Lunderstadt, J. & Zeeck, A. 1997. Phenols from *Fagus sylvatica* and their role in defence against *Cryptococcus fagisuga*. *Phytochemistry* 45: 51-57.

Notes: In extracts of inner and outer bark of *F. sylvatica*, qualitative dependence of the phenolic composition on infection with *Cryptococcus fagisuga* feeding in the parenchyma tissue was observed; seven major compounds were isolated and their structures completely assigned; changes observed in concentrations of these compounds after attack by this beech scale.

Duncan, R.W. 1996. Common insects damaging junipers, cedars and cypresses in British Columbia. Forest Pest Leaflet (Pacific Forestry Centre, Canadian Forest Service) 1996e(70): 8 pp.

Notes: Notes given on several species including *Carulaspis juniperi*.

Dunkelblum, E., Mendel, Z., Gries, G., Gries, R., Zegelman, L., Hassner, A. and Mori, K. 1996. Antennal response and field attraction of the predator *Elatophilus hebraicus* (Hemiptera: Anthocoridae) to sex pheromones and analogues of three *Matsucoccus* spp. (Homoptera: Matsucoccidae). *Bioorganic & Medicinal Chemistry* 4: 489-494.

Notes: Study of this predator's close association with *Matsucoccus josephi*, which utilizes the *M. josephi* sex pheromone as a kairomone; role of *M. feytaudi* and *M. matsumurae* also examined.

Dymock, J.J. & Holder, P.W. 1996. Nationwide survey of arthropods and molluscs on cut flowers in New Zealand. *New Zealand Journal of Crop and Horticultural Science* 24: 249-257.

Notes: *Aspidiotus nerii* was found at half the cymbidium sites surveyed.

Easwaramoorthy, S., David, H. & Gai, K.S. 1996. Studies on *Botryoideclava bharatiya* Subba Rao, a parasite of sugarcane scale insect, *Melanaspis glomerata* (Green). *Entomon* 21: 55-64.

Notes: Biology, life cycle, reproduction, and host selection of this gregarious ectoparasite of *M. glomerata*.

Ehnstrom, B. & Lundberg, S. 1997. [*Cryptolaemus montrouzieri*, a ladybird used for biological control in greenhouses in Sweden.] *Cryptolaemus montrouzieri*, en nyckelpiga som anvands for biologisk bekampning i vaxthus i Sverige. (In Swedish with summary in English). *Entomologisk Tidskrift*. Stockholm 118: 59-60.

Notes: A specimen of *Cryptolaemus montrouzieri* was found outside a greenhouse in the Botanical Garden of Uppsala, Sweden on 18 July 1993 and 21 July 1996. The species is registered for biological control in Sweden, and it had been used against Coccoidea in one of the greenhouses. *Hippodamia convergens* has also been introduced and tested for biological control in some greenhouses in Sweden. It is used in several European countries, including Denmark.

- Elder, R. J., Gultzow, D., Smith, D. & Bell, K.L. 1997. Oviposition by *Comperiella lemniscata* Compere and Annecke (Hymenoptera: Encyrtidae) in *Aonidiella orientalis* (Newstead) (Homoptera: Diaspididae). Australian Journal of Entomology 36(3):299-301.
- Notes: Both sexes of oriental scale, *Aonidiella orientalis*, were exposed to the parasitoid *Comperiella lemniscata* at the beginning of the first, second and third female instars. The parasitoid successfully oviposited and developed in second- and third-instar female scales, but male scales were used as hosts only in their second instar and at low levels. When given a choice, *C. lemniscata* oviposited only in third-instar female scales.
- Erkiliç, L. & Uygun, N. 1997. Studies on the effects of some pesticides on white peach scale, *Pseudaulacaspis pentagona* (Targ.-Tozz.) (Homoptera: Diaspididae) and its side-effects on two common scale insect predators. Crop Protection 16: 69-72.
- Notes: *Chilocorus bipustulatus* and *Cybocephalus fodori minor* were predators observed.
- Erkiliç, L.B. & Uygun, N. 1997. Development time and fecundity of the white peach scale, *Pseudaulacaspis pentagona*, in Turkey. Phytoparasitica 25: 9-16.
- Notes: Worldwide, polyphagous scale; widely distributed in Turkey; pest of peach trees; biology; temperature effects.
- Erler, F., Kozár, F. & Tunç, I. 1996. A preliminary study on the armoured scale insect (Homoptera, Coccoidea: Diaspididae) fauna of Antalya. Acta Phytopathologica et Entomologica Hungarica 31: 53-59.
- Notes: 29 species found in this West Mediterranean province of Turkey; four of them new to Turkish fauna: *Aonidia mediterranea*, *Neochionaspis asiatica*, *Lepidosaphes granati* and *Targionia nigra*.
- Evans, H.C. & Hywel-Jones, N.L. 1997. 2.1 Entomopathogenic fungi. Pp. 3-27. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Coccidae hosts mentioned include *Ceroplastes floridensis*, *Lecanium hesperidum* (= *Coccus hesperidum*), *Dialeurodes citri*, *Lecanium viride* (= *Coccus viridis*), *Saissetia coffeae*, *Vinsonia stellifera*, *Eucalymnatus tessellatus*, *Marsipicoccus marsupialis*, *Parasaissetia nigra*, *Pulvinaria* sp., *Chloropulvinaria psidii*, *Paralecanium expansum*, *Ceroplastes floridensis*, *C. sinensis*, *Milviscutulus mangiferae*, *Pulvinariella mesembryanthemi*, *Eulecanium tiliae*, *Ctenochiton viridis*, *Megalocryptes bambusicola*, *Toumeyella liriodendri*, *Parthenolecanium persicae* and *P. rufulum*.
- Evans, G.A. & Pedata, P.A. 1997. Parasitoids of *Comstockiella sabalis* (Homoptera: Diaspididae) in Florida and description of a new species of the genus *Coccobius* (Hymenoptera: Aphelinidae). Florida Entomologist 80: 328-334.
- Notes: *Coccobius donatellae* Pedata and Evans, spec. nov. is described and illustrated from specimens reared from *Comstockiella sabalis* on palmetto palm (*Sabal palmetto*) in Florida. *Coccobius donatellae* is the most common parasitoid that attacks this host in Florida and is believed to be the same species reported in the literature as *Physcus* sp. that was introduced into Bermuda from Florida in the 1920's. Evidence suggests that earlier reports of *Encarsia portoricensis* (Howard)

as a parasitoid of the palmetto scale are based on erroneous identifications of what were probably *Coccobius donatellae* males. Recent collections in Florida confirm *Aphytis diaspidis* (Howard), reported previously as *Aphytis fuscipennis*, and *Encarsia citrina* (Craw) as parasitoids of *C. sabalis*. Intraspecific variation occurring in *C. donatellae* and in *Coccobius testaceus* (Masi), is discussed.

Fernandez, M., Val, I., Proenza, M.A., Mesa, D. & Burgos, T. 1996. [Some causes for mortality of *Pinnaspis strachani* Cooley (Homoptera: Diaspididae) on grapefruit crops in the Isla de la Juventud. Part I.] Algunas de las causas de muerte de *Pinnaspis strachani* Cooley en el cultivo de toronja en Isla de la Juventud. (In Spanish with summary in English). *Revista de Protección Vegetal* 11: 91-94.

Notes: In a field of the Patria district in Isla de la Juventud, Cuba, 10 grapefruit cv. Ruby Red plants were sampled randomly to analyse the damage caused by *Pinnaspis strachani*. The results showed that *Cheletogenes ornatus* caused 37% mortality in crawlers. Parasitoids caused a 22 and 0.40% mortality in females and males, resp. The indiscriminant use of pesticides in 1990 and 1992 affected the development of natural enemies.

Fernando, L.C.P. & Walter, G.H. 1997. Species status of two host-associated populations of *Aphytis lingnanensis* (Hymenoptera: Aphelinidae) in citrus. *Bulletin of Entomological Research* 87: 137-144.

Notes: *Aonidiella aurantii* and *Unaspis citri* are hosts.

Fjeldsdalen, J. 1996. [Scale insects (Coccinea, Hom.) in Norway.] Skjoldlus (Coccinea, Hom.) i Norge. (In Norwegian). *Insekt-Nytt* 21: 4-24.

Notes: Species reviewed include *Arctorthezia cataphracta*, *Atrococcus paludinus*, *Phenacoccus aceris*, *P. piceae*, *Spinococcus calluneti*, *Planococcus citri*, *Pseudococcus viburni*, *Rhizoecus cacticans*, *Geococcus coffeae*, *Eriopeltis lichtensteini*, *Eulecanium sericeum*, *E. tiliae*, *Parthenolecanium corni*, *P. pomeranicum*, *Pulvinaria betulae*, *Chloropulvinaria floccifera*, *Coccus hesperidum*, *Saissetia coffeae*, *Pseudohermes fraxini*, *Gossyparia spuria*, *Asterodiaspis variolosa*, *Aulacaspis rosae*, *Chionaspis salicis*, *Epidiaspis leperii*, *Lepidosaphes newsteadi*, *L. ulmi*, *Leucaspis loewi*, *L. pini*, *Nuculaspis abietis*, *Aspidiotus nerii*, *Chrysomphalus dictyospermi*, *C. aonidum*, *Dynaspidotus britannicus*, *Hemiberlesia rapax*, *Pseudaulacaspis pentagona* and *Pinnaspis aspidistrae*.

Foldi, I. 1997. Defense strategies in scale insects: phylogenetic inference and evolutionary scenarios (Hemiptera, Coccoidea). (In English with summary in French). *Memoires du Museum National d'Histoire Naturelle (N.S.) Serie A, Zoologie* 173: 203-230.

Notes: The sedentary plant-parasitic habit of scale insects increases their vulnerability to natural enemies and to adverse environmental factors; strategies for defense include 1. construction of protective structures from secretions and/or excretions; 2. behavioral adaptations to exploit host-plant afforded protection; 3. modifications of their life-cycle in response to environmental factors; and 4. modifications of the female body to provide protection for their progeny.

Foldi, I. 1997a. The Xylococcinae (Hemiptera: Coccoidea: Margarodidae): Analysis of species characteristics and descriptions of a new genus. *Annales de la Société Entomologique de France* 33: 185-195.

Notes: A new genus, *Jansenus*, gen. n. is described for a new species *Jansenus burgeri*, sp. n. collected under the bark of *Tamarindus indica* L. from Thailand. First and second instars, nymphs and the adult female are described and illustrated. A key to the genera of the sub-family Xylococcinae is proposed. The phylogenetic position, biology, host plants, geographical distribution and economic importance of the species of Xylococcinae are discussed.

Foldi, I. 1997b. 1.1.2.6 Internal anatomy of the adult female. Pp. 73-90. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Discusses digestive system and associated structures, head capsule, mouthparts and feeding strategies, stylets, tentorium and stylet levers, salivary pump, filter chamber, respiratory system, excretory system, nervous system, female and male reproductive systems, and anal apparatus; species mentioned include *Parthenolecanium pomerinicum*, *P. rufulum*, *Pulvinariella* (*Pulvinaria*) *mesembryanthemi*, *Coccus hesperidum*, *Icerya purchasi*, *Planococcus citri* and *Chloropulvinaria floccifera*.

Foldi, I. 1997c. 1.1.2.7 Ultrastructure of integumentary glands. Pp. 91-109. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Discussions of the importance of wax gland structure in the classification of the Coccidae, cuticular structures associated with the wax glands, wax glands associated with the spiracles and spiracular furrows, ventral wax glands associated with sites of reproduction, wax glands associated with defence; species mentioned include *Anopulvinaria cephalocarinata*, *Ceroplastes sinensis*, *Chloropulvinaria floccifera*, *Coccus hesperidum*, *Eriocerus pela*, *Etiennea petasus*, *Gascardia madagascariensis*, *Inglisia vitrea*, *Parthenolecanium persicae*, *Pseudophilippia quaintancii*, *Pulvinaria ericicola*, *P. regalis*, *Saissetia coffeae*, *S. oleae*, *Toumeyella cerifera* and *T. pini*.

Fukatsu, T., Watanabe, K. & Kuriyama, H. 1996. Histochemical detection and molecular phylogeny of yeast-like symbionts of Aphidoidea, Coccoidea and Fulgoroidea. *Zoological Science* (Tokyo) 13 (Suppl.): 36.

Notes: Abstract of paper presented at 67th Annual Meeting of the Zoological Society of Japan, Sapporo, Japan, September 18-20, 1996.

Fusaro, E. 1997. [Preliminary results of experiments with Mediterranean provenances of *Pinus pinaster* in Italy.] Risultati preliminari sulla sperimentazione in Italia di alcune provenienze mediterranee di *Pinus pinaster* Ait. (In Italian with summary in English). *Monti e Boschi* 48: 48-53.

Notes: First results from maritime pine (*Pinus pinaster*) provenance trials established in 1985-86 at four locations in Italy. Eight years after planting, tree survival ranges from 85.6% to 93.6% (by site) and 74.2% to 96.3% (by provenance). At the

Ligurian test site, damage by *Matsucoccus feytaudi* was high on Tuscan and Corsican provenances (and to populations of *P. pinaster* growing locally), whereas 'Tamjoute' and the SE Spanish provenance 'Cuenca' were less susceptible. It is recommended that Tuscan and Corsican provenances are not selected for use in areas in Italy where attack by this insect pest is likely. In 1993, a tree breeding programme was initiated in Liguria and Tuscany, with two progeny tests of 274 half-sib 'Cuenca' families (seed supplies by INRA, Bordeaux), in order to develop *M. feytaudi*-resistant *P. pinaster* seed orchards.

Garonna, A. P. & Viggiani, G. 1997. [Survey of the parasitoids of *Pseudaulacaspis pentagona* (Targioni Tozzetti) (Homoptera: Diaspididae) in Italy and their distribution.] Indagine sui parassitoidi di *Pseudaulacaspis pentagona* presenti in Italia e loro distribuzione regionale. (In Italian with summary in English). Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'. Portici 53: 3-11.

Notes: Studies were carried out during 1988-93 in Italy on the parasitoids of *Pseudaulacaspis pentagona*. The most important parasitoid was *Encarsia berlesei* (over 70% of the total number). The hyperparasitoids were *Ablerus perspicuosus* (*Azotus perspicuosus*) and *Marietta carnesi*, with the latter appearing on *E. berlesei*.

Gehring, C.A., Cobb, N.S. & Whitham, T.G. 1997. Three-way interactions among ectomycorrhizal mutualists, scale insects, and resistant and susceptible pinyon pines. American Naturalist 149: 824-841.

Notes: Examination of how *Matsucoccus acalyptus*, pinyon needle scale, affects and is affected by the ectomycorrhizal mutualists found on roots of scale-resistant and -susceptible pinyon pines (*Pinus edulis*).

Getu, E. 1996. Cottony cushion scale infestation on Acacia trees. IAR Newsletter of Agricultural Research 11: 11.

Notes: *Icerya purchasi* is a minor pest of seedlings; chemical control recommended against ants which protect the pest from natural enemies to secure the honey dew; pest can cause death to trees.

Giliomee, J.H. 1997. 1.1.2.2 The adult male. Pp. 23-30. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Detailed morphology; vocabulary list of structures; no species mentioned.

Giliomee, J.H. 1997a. 1.1.3.2 Taxonomic characters - adult male. Pp. 139-142. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Species mentioned include *Ceroplastes ceriferus*, *Mesolecanium nigrofasciatum*, *Neolecanium cornuparvum*, *Toumeyella cerifera* and *T. liriodendri*.

Gill, R.J. 1997. The Scale Insects of California: Part 3. The Armored Scales (Homoptera: Diaspididae). California Dept. of Food & Agriculture, Sacramento, CA. 307 pp.

Notes: Technical Series in Agricultural Biosystematics & Plant Pathology No. 1. Field guide and laboratory manual; California armored scales listed; field characteristics; spp. which are similar; common hosts, distribution; biology; economic importance.

- Gill, R.J. 1997a. 3.3.1 Citrus. Pp. 207-215. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Notes on the major pests: *Saissetia oleae*, *Coccus hesperidum*, *C. pseudomagnoliarum*, *Ceroplastes rubens*, *C. destructor*, *C. sinensis*, *C. floridensis* and *Pulvinaria citricola*; minor species listed in table with countries affected.
- Gill, R.J. & Kosztarab, M. 1997. 3.1.1 Economic importance. Pp. 161-163. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: List of 50 major coccid pests of the world, their plant hosts and countries affected.
- Gora, V., König, J. & Lunderstädt, J. 1996. Population dynamics of beech scale (*Cryptococcus fagisuga*) (Coccina, Pseudococcidae) related to physiological defence reactions of attacked beech trees (*Fagus sylvatica*). *Chemoecology* 7: 112-120.
- Notes: Changes in the density of beech scale infestation (*Cryptococcus fagisuga*) of a mature beech stand (*Fagus sylvatica*) were investigated after gap-cutting in limed and unlimed areas bordering on the gaps and in untreated areas over a 5-year period. Concentrations of sucrose, protein amino acids, and procyanidins were also examined in the inner and outer bark of non-infested beech trees and beeches infested by beech scale. Procyanidin content increased, protein amino acid content decreased and a change in the outer bark-inner bark-ratio of the infested trees showed a transfer of compounds between inner and outer bark. Long lasting shifts occurred in the pattern of compounds of the bark irrespective of actual infestation intensity.
- Gowda, D.K.S., Manjunath, D., Pradip Kumar & Datta, R.K. 1996. *Spalgis epius* Westwood (Lepidoptera: Lycaenidae) - a potential predator of mulberry mealy bug, *Maconellicoccus hirsutus*. *Insect Environment* 2: 87.
- Notes: This mealybug is one of the major sucking pests of mulberry; survey of density of various stages of this species and occurrence on various parts of the plant.
- Grafton-Cardwell, E.E. & Reagan, C.A. 1997. Citricola scale insecticide efficacy trials, 1994, 1995. *Arthropod Management Tests* 22: 71.
- Notes: Nine insecticides evaluated against *Coccus pseudomagnoliarum* on *Coccus sinensis*.
- Granara de Willink, M.C. 1996. [The genus *Cerococcus* in Argentina (Homoptera: Cerococcidae).] El género *Cerococcus* en la Argentina (Homoptera: Cerococcidae). (In Spanish with summary in English). *Insecta Mundi* 10: 235-238.
- Notes: Key to the 5 species of *Cerococcus* found in Argentina; description of new species; biology; *C. catenarius* is recorded from Argentina for the first time.
- Greathead, D.J. 1997. 1.3.3 Crawler behaviour and dispersal. Pp. 339-342. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
- Notes: Species mentioned include *Aonidiella aurantii*, *Cryptococcus fagisuga*, *Aonidiella aurantii*, *Aulacaspis tegalensis*, *Ceroplastes floridensis*, *Coccus hesperidum*, *Dactylopius austrinus*, *Icerya seychellarum*, *Matsucoccus resinosae*, *Pulvinaria*

delottoi, *Pulvinariella mesembryanthemi*, *Saissetia oleae* and *Toumeyella numismaticum*.

Greathead, D.J. 1997a. 3.3.16 Tea. Pp. 387-392. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Coccidae species recorded from tea include *Ceroplastes ceriferus*, *C. destructor*, *C. floridensis*, *C. japonicus*, *C. pseudoceriferus*, *C. rubens*, *C. sinensis*, *C. vinsoni*, *Chloropulvinaria floccifera*, *C. psidii*, *Coccus africanus*, *C. alpinus*, *C. discrepans*, *C. formicarii*, *C. sp. as discrepans*, *C. hesperidum*, *C. pseudomagnoliarum*, *C. viridis*, *Dicyphococcus castilloae*, *Drepanococcus cajani*, *D. chiton*, *Eucalymnatus tessellatus*, *Maacoccus watti*, *Megapulvinaria maxima*, *Metaceronema japonica* (= *Eriochiton theae*), *Parasaissetia nigra*, *Parthenolecanium rufulum*, *Pulvinaria aurantii*, *P. obitsuensis*, *P. peregrina*, *Saissetia coffeae* and *S. oleae*; country; references.

Gross, S., Drieschpon, Y., Steinberg, S., Blumberg, D. & Mendel, Z. 1997. Mealybugs in citrus orchards in Israel: pest status and control. 10th Conference on Agricultural Entomology.

Notes: *Planococcus citri*, *Pseudococcus cryptus* and *Nipaecoccus viridis* cause serious damage to citrus in Israel; natural enemies include *Spectrobates ceratoniae*, *Cryptoblades gnidiella*, *Anagyrus pseudococci*, *Leptomastix dactylopii*, *Clausenia purpurea* and *Cryptollaemus montrouzieri*.

Gullan, P.J. 1997. 1.3.5 Relationships with ants. Pp. 351-373. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Topics are benefits of ants to coccids, effect of ant exclusion on coccids, coccid protection and ant aggression, benefits of coccids to ants, coccids relating to ants and ant-plants, suggestions for future research; species mentioned include *Akermes cordiae*, *Ceroplastes rusci*, *C. sinoiae*, *Coccus caviramicolus*, *C. celatus*, *C. circularis*, *C. hesperidum*, *C. formicarii*, *C. macarangicolis*, *C. macarangae*, *C. penangensis*, *C. secretus*, *C. tumuliferus*, *C. viridis*, *Cryptostigma biorbiculus*, *C. inquila*, *C. quinquipori*, *C. reticulolaminae*, *Cyclolecanium hyperbaterum*, *Drepanococcus chiton*, *Hemilecanium recurvatum*, *Milvisculutulus mangiferae*, *Myzolecanium kibarae*, *Parasaissetia nigra*, *Pulvinariella mesembryanthemi*, *Saissetia coffeae*, *S. miranda*, *S. zanzibarensis*, *Torarchus endocanthium*, *Toumeyella liriodendri* and *Udinia newsteadii*.

Gullan, P.J., Cranston, P.S. & Cook, L.G. 1997. The response of gall-inducing scale insects (Hemiptera: Eriococcidae: *Apiomorpha* Rübsaamen) to the fire history of mallee eucalypts in Dangali Conservation Park, South Australia. Transactions of the Royal Society of South Australia 121: 137-146.

Notes: Mallee communities, especially the plant components, are often considered to be fire-adapted but there is no information on how effectively any phytophagous insects re-establish their populations after a wildfire. This research examines the scale insect genus *Apiomorpha*, in which species induce conspicuous, sexually dimorphic galls of species-specific morphology on *Eucalyptus* species.

- Gullan, P.J. & Kosztarab, M. 1997. Adaptations in scale insects. *Annual Review of Entomology* 42: 23-50.
- Notes: Many unusual features of scale insects (Hemiptera: Coccoidea) can be explained as historical legacy. Developmental specializations in ancestral coccoids resulted in a neotenuous adult female and a drastic metamorphosis of the male. Subsequent evolution led to numerous, often convergently derived, adaptations to parasitic life on higher plants. Discussions of morphological adaptations in females and males, reproductive strategies, life-cycle adaptations, biotic interactions and suggested future research.
- Gullan, P.J. & Strong, K.L. 1997. Scale insects under eucalypt bark: a revision of the Australian genus *Phacelococcus* Miller (Hemiptera: Eriococcidae). *Australian Journal of Entomology* 36: 229-240.
- Notes: The scale insect genus *Phacelococcus* Miller originally was created for a single species, *Phacelococcus brookesae* Miller, found under the bark of *Eucalyptus globulus* Labill (Myrtaceae) in Tasmania. Three new species, all from under the bark of *Eucalyptus* species in mainland Australia, share the characteristics of *Phacelococcus*; clusters of quinquelocular pores, absence of enlarged dorsal setae and reduced anal lobes. *P. brookesae* is redescribed and the generic diagnosis of *Phacelococcus* is expanded to include the three species, *P. cookae* sp.n., *P. frenchi* sp.n. and *P. subcorticalis* sp.n., which are described and illustrated. The latter two species are sometimes so abundant on the trunks of their host trees that they are fed upon by yellow-bellied gliders and probably Leadbeater's possums (Mammalia: Marsupialia: Petauridae).
- Halbert, S.E. 1996. Entomology section. Tri-ology 35(3): 4-10.
- Notes: Species mentioned include *Pseudococcus longispinus*, *Philephedra tuberculosa*, *Planococcus citri*, *Parasaissetia nigra*, *Pseudaulacaspis pentagona*, *Chrysomphalus dictyospermi*, *Coccus hesperidum*, *Parthenolecanium corni*, *Abgrallaspis cyanophylli* and *Mesolecanium nigrofasciatum*.
- Halbert, S.E. 1996a. Entomology section. Tri-ology 35(4): 4-8.
- Notes: Species mentioned include *Ischnaspis longirostris*, *Diaspis boisduvalii*, *Toumeyella liriodendri*, *Aspidiotus destructor*, *Pseudococcus landoi*, *Icerya purchasi* and *Hallaspis asymmetrica*.
- Halbert, S.E. 1996b. Entomology section. Tri-ology 35(5): 4-9.
- Notes: Species recorded include *Abgrallaspis cyanophylli*, *Aulacaspis yasumatsui*, *Rhizoecus hibisci*, *Howardia biclavis*, *Hypogeococcus pungens*, *Pulvinaria urbicola*, *Parlatoria proteus*, *Philephedra tuberculosa*, *Pseudaulacaspis pentagona*, *Toumeyella liriodendri*, *Pseudaulacaspis cockerelli*, *Andaspis punicae*, *Planococcus citri*, *Pseudaulacaspis pentagona* and *Pulvinaria psidii*.
- Hamilton, K.G.A. 1996. Cretaceous Homoptera from Brazil: Implications for classification. Pp. 89-110. in: Schaefer, C.W., Ed. *Studies on Hemipteran phylogeny*. Entomological Society of America, Lanham, MD. 244 pp.
- Notes: Series: Thomas Say publications in entomology: Proceedings.

- Hao, J.J., Wu, S., Jia, C. & Tang, F.T. 1997. A strange eriococcid genus found in China with description of a new species (Homoptera, Coccoidea, Eriococcidae). (In Chinese with summary in English). *Acta Entomologica Sinica* 40: 71-74.
Notes: *Aculeococcus morrisoni* recorded in 1941 from Brazil; this paper describes a second species of this genus, *A. yongpingensis*.
- Hare, J.D. & Morgan, D.J.W. 1997. Mass-priming *Aphytis*: Behavioral improvement of insectary-reared biological control agents. *Biological Control* 10(3): 207-214.
Notes: The introduced parasitoid, *Aphytis melinus* DeBach (Hymenoptera: Aphelinidae), is used for augmentative biological control of California red scale, *Aonidiella aurantii* (Maskell) (Homoptera: Diaspididae). Commercially reared wasps are reared on oleander scale, *Aspidiotus nerii* Bouche (Homoptera: Diaspididae). Oleander scale covers lack the chemical, O-caffeoyltyrosine, a kairomone mediating host selection by *A. melinus*. Wasps reared on oleander scale but individually exposed, or primed, to O-caffeoyltyrosine more readily accepted California red scale for probing in laboratory bioassays and parasitized a greater proportion of available California red scale in the field than wasps reared similarly but not exposed to O-caffeoyltyrosine.
- Hare, J.D., Morgan, D.J.W. & Nguyun, T. 1997. Increased parasitization of California red scale in the field after exposing its parasitoid, *Aphytis melinus*, to a synthetic kairomone. *Entomologia Experimentalis et Applicata* 82: 73-81.
Notes: The introduced parasitoid, *Aphytis melinus* utilizes a kairomone, O-caffeoyltyrosine, to recognize California red scale, *Aonidiella aurantii*; wasps used in augmentative release programs for California red scale on California citrus are reared on oleander scale, *Aspidiotus nerii*, themselves reared on squash.
- Harris, K.M. 1997. Cecidomyiidae and other Diptera. Pp. 61-68. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442.pp.
Notes: Coccidae hosts mentioned include *Alichtensia* sp., *Aonidiella aurantii*, *Ceroplastes floridensis*, *Chloropulvinaria polygonata*, *C. psidii*, *Chrysomphalus dictyospermi*, *Coccus hesperidum*, *Cryptococcus fagisuga*, *Eriococcus* sp., *Ferrisia virgata*, *Lepidosaphes beekii*, *Megapulvinaria maxima*, *Microperispha pulvinariae*, *Parasaissetia nigra*, *Parlatoria ziziphi*, *Philephedra tuberculosa*, *Protopulvinaria pyriformis*, *Pulvinaria ficus*, *P. urticae*, *Saissetia coffeae* and *S. oleae*.
- Hasey, J.K., Johnson, R.S., Meyer, R.D. & Klonsky, K. 1997. An organic versus a conventional farming system in kiwifruit. *Acta Horticulturae* 444: 223-228.
Notes: To determine the feasibility of growing kiwifruits organically in California, a kiwifruit vineyard converted to an organic farm was compared with a conventionally farmed vineyard from 1990 to 1992. January or March applications of composted chicken manure (organic system) or NH_4NO_3 plus $\text{CaNH}_4(\text{NO}_3)_3$ through microsprinklers during the growing season (conventional system) Damage from latania scale (*Hemiberlesia lataniae*) and omnivorous leaf roller (*Archips podanus*?) was small in both systems, except for scale damage in the organic system in 1992.

- Hata, T.Y., Hara, A.H. & Hu, B.K.S. 1996. Use of a systemic insecticide granule against root mealybugs, Hawaii, 1995. Pp. 382. *in*: Burditt, A.K., Jr. (Ed.). *Arthropod Management Tests*, Vol. 21. Entomological Society of America, Lanham, MD. 462 pp.
Notes: Efficacy trials of Marathon IG against *Rhizoecus hibisci* on *Rhapis excelsa*.
- Hayat, M. 1997. 2.3.2. Aphelinidae. Pp. 111-145. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
Notes: At least 175 scale hosts mentioned; those with the most Aphelinid species as parasitoids include *Ceroplastes destructor*, *C. rubens*, *Chloropulvinaria psidii*, *Coccus hesperidum*, *C. longulus*, *C. pseudomagnoliarum*, *C. viridis*, *Eulecanium tiliae*, *Lichtensia viburni*, *Marsipococcus proteae*, *Mesolecanium nigrofasciatum*, *Parasaissetia nigra*, *Parthenolecanium corni*, *P. persicae*, *Pulvinaria polygonata*, *P. vitis*, *Saissetia coffeae*, *S. oleae*, *S. persimilis*, *S. somereni*, *Sphaerolecanium prunastri* and *Waxiella mimosae*.
- Heimpel, G.E., Rosenheim, J.A. & Mangel, M. 1996. Egg limitation, host quality, and dynamic behavior by a parasitoid in the field. *Ecology* 77: 2410-2420.
Notes: Study of *Aphytis aonidiae*, a parasitoid that attacks *Quadraspidotus perniciosus*.
- Heng-Moss, T.M., Baxendale, F.P., Weinhold, A.P. 1996. Mealybug control on buffalograss turf in Saunders Co., Nebraska, 1995. Pp. 354-355. *in*: Burditt, A.K., Jr. (Ed.). *Arthropod Management Tests*, Vol. 21. Entomological Society of America, Lanham, MD. 462 pp.
Notes: 26 treatments evaluated against *Trionymus sporoboli* and *Trionymus* sp. on *Buchloe dactyloids*.
- Ho, C.T. & Khoo, K.C. 1997. Partners in biological control of cocoa pests: mutualism between *Dolichoderus thoracicus* (Hymenoptera: Formicidae) and *Cataenococcus hispidus* (Hemiptera: Pseudococcidae). *Bulletin of Entomological Research* 87: 461-470.
Notes: The observed mutualistic relationship between the ant *Dolichoderus thoracicus* and the pseudococcid *Cataenococcus hispidus* was examined. The importance of *C. hispidus* to *D. thoracicus* as a food source was investigated by giving *D. thoracicus* access to *C. hispidus* only, to *C. hispidus* and other food sources, and denying access to any obvious food sources. *D. thoracicus* was seen to depend on *C. hispidus* alone as a source of food over an eight-week period of observation without showing ill effects. The role of *D. thoracicus* in spreading *C. hispidus* was studied in an experiment consisting of combinations of *D. thoracicus* and *C. hispidus* exclusion. It was shown that *D. thoracicus* was responsible for carrying *C. hispidus* across a 'mealybug excluder'. Data on the frequency and duration of transport of *C. hispidus* by *D. thoracicus* were obtained by direct observation for a total of 90 h over 17 days.
- Hodgson, C.J. 1997. 1.1.2 Systematics. 1.1.3.1. Taxonomic characters: adult female. Pp. 111-137. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
Notes: Appearance of unmounted insects and mounted insects: structures on dorsum, structures associated with margin, structures on venter; 60 scale species mentioned.

- Hodgson, C.J. 1997a. 1.1.3.4. Classification of the Coccidae and related coccoid families. Pp. 157-201. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
Notes: Discussions of each of 12 families: Aclerdidae, Asterolecaniidae, Cerococcidae, Cryptococcidae, Dactylopiidae, Eriococcidae, Kermesidae, Lecanodiaspididae, Micrococcidae, Tachardiidae, Coccidae and Pseudococcidae; table comparing characters of each of these families; notes on 10 subfamilies of Coccidae and tribes.
- Houck, M.A. & OConnor, B.M. 1996. Temperature and host effects on key morphological characters of *Hemisarcoptes cooremani* and *Hemisarcoptes malus* (Acari: Hemisarcoptidae). *Experimental & Applied Acarology* 20: 667-682.
Notes: *Aspidiotus nerii* and *Aonidiella aurantii* served as hosts.
- Hoy, L.E. & Whiting, D.C. 1997. Low-temperature storage as a postharvest treatment to control *Pseudococcus affinis* (Homoptera: Pseudococcidae) on Royal Gala apples. *Journal of Economic Entomology* 90(5): 1377-1381.
Notes: Royal Gala apples infested by the obscure mealybug, *Pseudococcus affinis* (Maskell), were stored at 0, 4, and 7 \pm 0.5 degree C for various durations from 0 (control) to 126 d. As storage temperature decreased, the estimated times for 50 and 99% *P. affinis* mortality (LT-50 and LT-99, respectively) decreased. The LT-50 pattern became more evident with increasing temperature. At both 4 and 7 degree C, mean 1st-instar LT-99 values were less than those for 2nd-3rd instars and female adults. Storage at 0 degree C resulted in the lowest mean LT-99s for 1st instars, 2nd-3rd instars, and female adults (16.1, 19.0, and 18.9 d, respectively). A large-scale test storing 6,403 1st instars, 3,050 2nd-3rd instars, and 3,028 female adults at 0 degree C for 42 d resulted in complete mortality.
- Hu, B.K.S., Hara, A.H. & Hata, T.Y. 1996. Hot water as a potential treatment against root mealybugs, Hawaii, 1995. Pp. 382-383. *in*: Burditt, A.K., Jr. (Ed.). *Arthropod Management Tests*, Vol. 21. Entomological Society of America, Lanham, MD. 462 pp.
Notes: Hot water evaluated as treatment against *Rhizoecus hibisci* on *Rhapis excelsa*.
- Hu, J.S., Sether, D.M., Liu, X.P., Wang, M., Zee, F. & Ullman, D.E. 1997. Use of a tissue blotting immunoassay to examine the distribution of pineapple closterovirus in Hawaii. *Plant Disease* 81: 1150-1154.
Notes: Studies of the association of PCV with mealybug [*Dysmicoccus brevipes*] wilt of pineapple (MWP) suggest that PCV may be involved in MWP.
- Hu, J.S., Sether, D.M. & Ullman, D.E. 1996. Detection of pineapple closterovirus in pineapple plants and mealybugs using monoclonal antibodies. *Plant Pathology* 45: 829-836.
Notes: PCV was detected from mealybugs [*Dysmicoccus brevipes*] collected from wilted pineapple plants, but not from mealybugs of the same species collected from a colony reared on squash; the role of PCV in mealybug wilt is being investigated.
- Huang, G.Y. & Lu, J.F. 1997. Experiment in controlling citrus scales. (In Chinese). *South China Fruits* 26: 24.
Notes: During 1994-1996, various insecticides were tested for the control of *Unaspis yanonensis*, *Aonidiella auranti* and other scales on Citrus. It was found that 35%

Kuaik emulsion (comprising an organophosphorus agent + insect-growth inhibitor), was more effective than 40% omethoate, 40% Optunal (1-methylethyl 2-((aminomethoxyphosphinothioyl)oxy)benzoate), and 40% Supracide (methidathion).

Hurst, G.D.D., Majerus, M.E.N. & Fain, A. 1997. Coccinellidae (Coleoptera) as vectors of mites. *European Journal of Entomology* 94: 317-319.

Notes: This project investigates the possible wider importance of coccinellids, important predators of diaspidid scale insects, as vectors of mites.

Hussain, M.A., Puttaswamy & Viraktamath, C.A. 1996. Effect of botanical oils on lantana bug, *Orthezia insignis* Browne infesting crossandra. *Insect Environment* 2: 85-86.

Notes: This plant host is an important ornamental flower crop; 18 treatments evaluated.

Hywel-Jones, N.L. 1997. *Torrubiella patchii*, a new species of scale insect pathogen from Thailand. *Mycological Research* 101: 143-145.

Notes: Scale insect species not identified.

Ichikawa, A., Takahashi, H., Ooi, T. & Kusumi, T. 1997. Absolute configurations of some hydroxy-fatty acids produced by the insect genus *Laccifer*. *Biosciences, Biotechnology and Biochemistry* 61: 881-883.

Notes: The absolute configurations of some hydroxy-fatty acids were examined by the modified Mosher's method proposed by Ohtani et al. The absolute configurations of the major components were determined from NMR data of their MTPA esters and 2-NMA esters. The application of Mosher's method for the anti-glycol is discussed. Host plants of *Laccifer sindica* and *L. chinensis* are *Ziziphus mauritiana* and *Dalbergia obtusifolia*, respectively.

Itioka, T. & Inoue, T. 1996. The role of predators and attendant ants in the regulation and persistence of a population of the citrus mealybug *Pseudococcus citriculus* in a Satsuma orange orchard. *Applied Entomology and Zoology*. Tokyo 31: 195-202.

Notes: Results indicate that predators regulate the population of *P. citriculus* and that ant-attendance is indispensable to the persistence of the mealybug populations.

Itioka, T. & Inoue, T. 1996a. Density-dependent ant attendance and its effects on the parasitism of a honeydew-producing scale insect, *Ceroplastes rubens*. *Oecologia* 106: 448-454.

Notes: Intensity of attendance of *Lasius niger* estimated at different manipulated densities in a citrus orchard in Honshu, Japan.

Itioka, T. & Inoue, T. 1996b. The consequences of ant-attendance to the biological control of the red wax scale insect *Ceroplastes rubens* by *Anicetus beneficus*. *Journal of Applied Ecology* 33: 609-618.

Notes: Ant exclusion experiments in a satsuma orchard in Honshu, Japan; parasitoids frequently observed to interrupt their ovipositional behaviour due to interactions with ants attending host aggregations; ant attendance caused decrease in percentage of parasitism and consequently an increase in the growth rate of the host populations.

Itioka, T., Inoue, T., Matsumoto, T. & Ishida, N. 1997. Biological control by two exotic parasitoids: eight-year population dynamics and life tables of the arrowhead scale. *Entomologia Experimentalis et Applicata* 85: 65-74.

- Notes: To determine the process of regulation of the diaspidid *Unaspis yanonensis* by two introduced parasitoids, *Aphytis yanonensis* and *Coccobius fulvus*, the temporal changes in the population density of *U. yanonensis* as well as the parasitism rates were monitored for 8 years before and after the release of the two parasitoids in a Satsuma mandarin orange (*Citrus unshiu*) orchard in Wakayama Prefecture, Japan.
- Izraylevich, S. & Gerson, U. 1996. Sex allocation by a mite parasitic on insects: local mate competition, host quality and operational sex ratio. *Oecologia* 108: 676-682.
- Notes: *Hemisarcophytes coccophagus* studied on unnamed scale hosts.
- Jactel, H., Perthuisot, N., Menassieu, P., Raise, G. & Burban, C. 1996. A sampling design for within-tree larval populations of the maritime pine scale, *Matsucoccus feytaudi* Duc. (Homoptera: Margarodidae), and the relationship between larval population estimates and male catch in pheromone traps. (In English with summary in French). *Canadian Entomologist* 128: 1143-1156.
- Notes: Sampling procedures included random sampling without replacement, and systematic sampling with and without a linear model; relative precision of the sampling was affected by number, size and bark thickness of the sample units.
- Jaiswal, A.K., Sharma, K.K., Bhattacharya, A., Sushil, S.N. & Mishra, Y.D. 1996. Exploring kairomonal activity in lac insect, *Kerria lacca* (Kerr.) against its predator, *Eublemma amabilis* Moore. *Journal of Entomological Research*. New Delhi 20: 349-353.
- Notes: Whole body extracts of the lac insect, *Kerria lacca* and its secretory/excretory products (resin, wax and honeydew) were assayed for kairomonal activity against its predator *Eublemma amabilis* with respect to oviposition behaviour. The whole body extract containing mainly haemolymph exhibited kairomonal activity as exemplified by 65.03% eggs laid on paper strips treated with such extract. On the other hand, paper strips treated with resin, honeydew and wax revealed only 7.81%, 9.75% and 8.77% of the total eggs laid, resp., as against 8.64% in the control. Thus, the latter three components did not show any activity.
- James, D.G., Stevens, M.M. & O'Malley, K.J. 1997. The impact of foraging on populations of *Coccus hesperidum* L. (Hem., Coccidae) and *Aonidiella aurantii* (Maskell) (Hem., Diaspididae) in an Australian citrus grove. *Journal of Applied Entomology* 121: 257-259.
- Notes: *Coccus hesperidum*, and the non-honeydew-producing armoured scale, *Aonidiella aurantii*, were evaluated during two seasons in southern New South Wales. Numbers of *C. hesperidum* and *A. aurantii* were substantially greater (3-12 times) in trees containing foraging ants than in trees from which ants were excluded. It is likely that *I. rufoniger* gp. spp. protects both scale species by disrupting the activity of natural enemies. Effective control of honeydew-seeking ants appears to be a prerequisite for biological control-based management of honeydew-producers in Australian citrus groves.
- Jelkmann, W., Fechtner, B. & Agranovsky, A.A. 1997. Complete genome structure and phylogenetic analysis of little cherry virus, a mealybug-transmissible closterovirus. *Journal of General Virology* 78: 2067-2071.
- Notes: The 5'-terminal genomic region (8597 nucleotides (nt)) of little cherry virus (LChV), a mealybug-borne (Pseudococcidae) closterovirus, was cloned from

double-stranded RNA, and its sequence was determined. Phylogenetic reconstruction based on the aligned RNA polymerase sequences suggested that the aphid-transmissible and whitefly-transmissible closteroviruses represent 2 distinct evolutionary lineages, with the mealybug-transmissible LChV being the most remote member of the whitefly lineage.

Jena, B.C., Nayak, N., Das, P.K. & Parida, A.K. 1996. The scale insect and its integrated management. *Indian Sugar* 46: 193-196.

Notes: Fifteen species of scale insects that occur on sugarcane in India are: *Ceroplastes actiniformis*, *Pulvinaria elongata*, *Saccharolecanium krugeri*, *Melanaspis glomerata*, *Aulacaspis madiunensis*, *Odonaspis saccharicaulis*, *Aspidiella sacchari*, *Duplachionaspis divergens*, *Temnaspidotus kellyi*, *Marsipococcus* sp., *Greenaspis decursata*, *Acanthomytilus sacchari*, *Acelerda* (*Aclerda*?) *japonica*, *A. japonica* var. *inermis* and *A. disrarta*.

Jenser, G., Balázs, K., Erdélyi, C., Haltrich, A., Kozár, F., Markó, V., Rácz, V. & Samu, F. 1997. The effect of an integrated pest management program on the arthropod populations in a Hungarian apple orchard. (In English with summary in Hungarian). *Zahradnictví--Hort.Sci.* (Prague) 24: 63-76.

Notes: Due to regular application of selective insecticides, the population density of parasitoids and predators increased while some others decreased; density of *Quadraspidotus perniciosus* rose.

Jeon, H., Kim, D., Yiem, M. & Lee, J. 1996. Modeling temperature-dependent development and hatch of overwintered eggs of *Pseudococcus comstocki* (Homoptera: Pseudococcidae). *Korean Journal of Applied Entomology* 35: 119-125.

Notes: Hatch times of overwintered eggs were compared at five constant temperatures (10, 15, 20, 25 deg C) and different collection dates. A non linear, four-parameter developmental model with high temperature inhibition accurately described ($R^2=0.99729$) with a cumulative Weibull function. Least-squares linear regression described development in the linear region (15-25 deg C) of the development curve. The low development threshold temperature was estimated as 11.9 deg C and 154.14 degree-days were required for complete development.

Ji, L., Izraylevich, S., Gazit, S. & Gerson, U. 1996. A sex-specific tri-trophic-level effect in a phoretic association. *Experimental & Applied Acarology* 20: 503-509.

Notes: *Hemisarcoptes coccophagus* is an obligate parasite of armored-scale insects (Homoptera: Diaspididae); *Saissetia coffeae* and *Aonidiella aurantii* were reared on potato tubers for this experiment.

Jonsson, A.M. 1996. [Beech bark disease and beech scale insect in succession to contamination?] *Bokbarksjuka och bokskoldloss i fororeningarnas slaptag?* (In Swedish). *Skog&Forskning* 3: 22-24.

Notes: The distributions of beech (*Fagus sylvatica*) bark disease (caused by *Nectria*) and its vector *Cryptococcus fagisuga* in Skane, Sweden, are mapped, and a theoretical scheme is presented linking their incidence to the deposition of nitrogen, atmospheric contamination, enhanced growth, nutritional imbalance and their effects on the vector and beech bark disease.

- Karam, H.H. & Abou-Lkhair, S.S. 1996. Two mealybugs' parasitoids newly recorded in Egypt (Hymenoptera: Encyrtidae). *Alexandria Journal of Agricultural Research* 41: 141-149.
Notes: *Anagyrus shahidi* recorded on *Antonina graminis* and *Rhopus nigriclavus* on *Brevinnia rehi*.
- Kim, J.K. 1997. Development and reproductive capacity of *Protopulvinaria mangiferae* (Green) (Homoptera: Coccidae). *Korean Journal of Applied Entomology* 36: 43-47.
Notes: This study was carried out in the laboratory to clarify effects of different temperatures of *Protopulvinaria mangiferae* (Green) on development, survivorship and reproduction. Developmental period of the mango shield scale from crawlers to preoviposition adult decreased as temperature increased.
- Koehler, G. 1996. Use of beneficial organisms in Saxonia: Experiments of introduction. (In German). Pp. 482. in: Laux, W. (Ed.) *Mitteilungen aus der Biologischen Bundesanstalt für Land- und Forstwirtschaft Berlin-Dahlem. Biologische Bundesanstalt für Land- und Forstwirtschaft, Berlin-Dahlem, Germany.* 662 pp.
Notes: Heft 321; (Communications from the Federal Biological Institute for Agriculture and Forestry, Berlin-Dahlem, No. 321); 50th German Meeting on Plant Protection, Muenster, Germany, September 23-26, 1996. *Pseudococcus affinis* mentioned.
- Kosztarab, M. 1997. *Transylvanian Roots: The True Life Adventures of a Hungarian American.* Pocahontas Press, Blacksburg, VA. 223 pp.
- Kosztarab, M. 1997a. 3.3.11 Coniferous forest trees. Pp. 343-346. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp
Notes: Pest species mentioned in table include *Eulecanium sericeum*, *Parthenolecanium fletcheri*, *Physokermes hemicryphus*, *P. piceae*, *P. taxifoliae*, *Pseudophilippia quaintaincii*, *Toumeyella parvicornis*, *T. pini* and *T. virginiana*.
- Kosztarab, M. 1997b. 3.3.12 Deciduous forest trees. Pp. 347-355. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
Notes: Scale pests of deciduous forest trees include *Ceroplastes ceriferus*, *C. destructor*, *C. floridensis*, *C. rubens*, *Chloropulvinaria floccifera*, *C. psidii*, *Coccus hesperidum*, *C. longulus*, *C. viridis*, *Ericerus pela*, *Eulecanium cerasorum*, *E. ciliatum*, *E. franconicum*, *E. tiliae*, *Mesolecanium nigrofasciatum*, *Neolecanium cornuparvum*, *Neopulvinaria innumerabilis*, *Palaeolecanium bituberculatum*, *Parasaissetia nigra*, *Parthenolecanium corni*, *P. quercifex*, *P. rufulum*, *Pulvinaria acericola*, *P. ericicola*, *P. vitis*, *Saissetia coffeae*, *S. oleae*, *Sphaerolecanium prunastri* and *Vinsonia stellifera*; field characters; common host plants; infestation site, distribution; major references.
- Kosztarab, M. 1997c. 3.3.13 Ornamental and house plants. Pp. 357-366. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
Notes: Coccid pests of ornamental plants include *Ceroplastes ceriferus*, *C. cirripediformis*, *C. destructor*, *C. floridensis*, *C. rubens*, *C. sinensis*, *Chloropulvinaria floccifera*, *C. psidii*, *Coccus hesperidum*, *C. pseudoheperidum*,

C. pseudomagnoliarum, *C. viridis*, *Eucalymnatus tessellatus*, *Eulecanium tiliae*, *Kilifia acuminatis*, *Milviscutulus mangiferae*, *Neopulvinaria innumerabilis*, *Parasaissetia nigra*, *Parthenolecanium corni*, *P. fletcheri*, *P. persicae*, *Physokermes hemichryphus*, *P. piceae*, *Protopulvinaria pyriformis*, *Pulvinaria citricola*, *P. urbicola*, *P. vitis*, *Pulvinariella mesembryanthemi*, *Saissetia coffeae*, *S. miranda*, *S. oleae*, *Sphaerolecanium prunastri* and *Vinsonia stellifera*.

Koteja, J. 1996. Avoid clearing. Inclusion Wrostek 22: 14.

Notes: Clearing amber for jewellers' purposes may contaminate inclusions for paleontologists' purposes.

Koteja, J. 1996a. Beware of oil. Inclusion Wrostek 22: 15.

Notes: Submerging specimens in "oil" as a means for improving preservation can cause penetration of the shifting of the fragments within.

Koteja, J. 1996b. Figures on p. 16 and 17. Inclusion Wrostek 22: 15-17.

Notes: Photographs of details of *Matsucoccus larssoni* and *M. electrinus*.

Koteja, J. 1996c. Florence viewed from Cracow. Inclusion Wrostek 23: 10-11.

Notes: Overview of the 20th International Conference of Entomology, Aug. 25-31, in Florence, Italy.

Koteja, J. 1997. With Microsoft (through Windows) into the XVIII Century. Inclusion Wrostek 26: 17.

Notes: Criticism of ScaleNet, the ongoing World Wide Web catalog of scales, for its editors' decision to synonymize genera.

Koteja, J. 1997a. Amberif '97. Inclusion Wrostek 26: 12.

Notes: Review of exposition of amber, silver, gold, diamonds and other mineral artifacts in Gdansk; discussions with colleagues and friends; paucity of inclusions.

Koteja, J. 1997b. Comments. Inclusion Wrostek 26: 22.

Notes: Discusses phylogenetic systematics; establishment of *Parthenolecanium* some 60 years before mentioned as example of genus described prior to discovery of males.

Koteja, J. 1997c. Scale insects (Homoptera) in Cretaceous amber. Inclusion Wrostek 27: 16.

Notes: [Abstract of a paper presented at the international interdisciplinary amber symposium "Baltic amber and other fossil resins," Gdansk, September 2-6, 1997.] Brief history of paleontological studies through the first half of the 20th century; species mentioned include *Electrococcus canadensis* and *Inka minuta*. [Koteja000c]

Koya, K.M.A., Devasahayam, S., Selvakumaran, S. & Kallil, M. 1996. Distribution and damage caused by scale insects and mealy bugs associated with black pepper (*Piper nigrum* Linnaeus) in India. Journal of Entomological Research. New Delhi 20: 129-136.

Notes: 18 genera/species of scale insects and mealybugs shown to infest this crop, including *Icerya* sp., *I. aegyptiaca*, *Planococcus* sp., *P. minor*, *Ferrisia virgata*, *Pseudococcus* sp., *P. longispinus*, *P. ?orchidicola*, *Marsipococcus marsupialis*, *Protopulvinaria longivalvata*, *Aspidiotus destructor*, *Lepidosaphes piperis*, *Parlatoria pergandii*, *Pinnaspis strachani*, *Pseudaulacaspis* sp., *P. cockerelli*, *?Unnaspis* (*Unaspis*? sp. and *Anomalococcus indicus*; plant parts affected; location of infestation in India.

- Kozár, F. 1996. Book Review: Kosztarab, M.: Scale insects of Northeastern North America. Identification, Biology and Distribution. Acta Phytopathologica et Entomologica Hungarica 31: 303.
Notes: High recommendation of this book for coccidologists, entomologists, plant protection and extension personnel.
- Kozár, F. & Ben-Dov, Y. 1997. 1.1.3.6 Zoogeographical considerations and status of knowledge of the family. Pp. 213-228. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
Notes: Characteristics of the Coccidae fauna of the 10 zoogeographical regions such as number of genera and species, and host type; connections between regions; species mentioned include *Eulecanium tiliae*, *Parthenolecanium corni*, *Physokermes piceae* and *Pulvinaria vitis*.
- Kozár, F., Fowjhan, M.A. & Zarrabi, M. 1996. Check-list of Coccoidea and Aleyrodoidea (Homoptera) of Afghanistan and Iran, with additional data to the scale insects of fruit trees in Iran. Acta Phytopathologica et Entomologica Hungarica 31: 61-74.
Notes: Mentions *Aonidiella aurantii*, *Diaspidiotus prunorum*, *Nilotaspis halli*, *Parlatoria oleae*, *P. crypta*, *Pseudaulacaspis pentagona*, *Parthenolecanium corni* and *P. crypta*.
- Kozár, F. & Hippe, C. 1996. A new species from the genus *Greenisca* Borchsenius, 1948 and additional data on the occurrence of scale insects (Homoptera: Coccoidea) in Switzerland. Folia Entomologica Hungarica 62: 91-96.
Notes: Description and illustration of *Greenisca erwini*, new sp.; other scales and hosts mentioned include *Balanococcus boratynski*, *Heterococcus nudus*, *Planococcus citri*, *Pseudococcus affinis*, *P. calceolariae*, *Trionymus newsteadi*, *T. singulari*, *Greenisca gouxii*, *G. erwini*, *Coccus hesperidum*, *Parafairmairia gracilis*, *Parthenolecanium corni*, *Saissetia coffeae*, *Planchonia arabidis*, *Acutaspis perseae*, *Aonidia lauri*, *Aspidiotus nerii*, *Diaspis bromeliae*, *Epidiaspis leperii*, *Furchadaspis zamiae*, *Gymnaspis aechmeae*, *Lepidosaphes ulmi*, *Leucaspis pusilla*, *Pseudaulacaspis pentagona* and *Rhizaspidiotus bivalvatus*.
- Krishnamoorthy, A. & Mani, M. 1996. Suppression of brinjal mealybug *Coccidohystrix insolita* with *Cryptolaemus montrouzieri*. Insect Environment 2: 50.
Notes: Potted aubergine (*Solanum melongena*) or eggplant) plants were infested with *Coccidohystrix insolita* in the greenhouse in Karnataka, India; a week later, 2nd-instar larvae of *Cryptolaemus montrouzieri* were released at rates of 0, 2, 5 and 10/plant. The pest was eradicated in 20 and 2 days following release of 2 and 10 predators/plant, resp., indicating the potential of the coccinellid for controlling the mealybug on aubergine.
- Kumar, P. & Srivastava, S.C. 1996. Record of *Flemingia stricta* as a lac host. Indian Forester 122: 765-766.
- Kunkel, H. 1997. 1.2.3 Soft scales as beneficial insects. 1.2.3.1 Scale insect honeydew as forage for honey production. Pp. 291-302. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam &

New York. 452 pp.

Notes: Topics are distribution and diversity of species visited by honeybees, regions where the honeybee is endemic (Norway and Greece), regions where the honeybee has been introduced (U.S., New Zealand & South America), attractiveness of honeydew, amounts of honeydew, factors affecting the build-up of scale insect populations, and the role of apiculturists; species mentioned include *Dactylopius coccus*, *Ericerus pela*, *Coccus hemicyphus*, *Physokermes hemicyphus*, *P. piceae*, *Parthenolecanium piceae*, *P. rufulum*, *P. corni*, *P. fletcheri*, *Phyllostroma myrtilli*, *Kermes quercus*, *Marchalina hellenica*, *Ceroplastes rusci*, *Eulecanium sericeum*, *Pulvinaria pistaciae*, *Aclerda berlesii*, *Xylococcus macroparpi*, *Neopulvinaria innumerabilis*, *Ultracoelostoma assimile* and *Toumeyella parvicornis*.

Labuschagne, T.I., Daneel, M.S. & De Beer, M. 1996. Establishment of *Aphytis* sp. (Hymenoptera: Aphelinidae) and *Cybocephalus binotatus* Grouvelle (Coleoptera: Nitidulidae) in mango orchards in South Africa for control of the mango scale, *Aulacaspis tubercularis* Newstead (Homoptera: Diaspididae). Yearbook (South African Mango Growers' Association) 16: 20-22.

Notes: In field studies in mango producing areas, percentage parasitism by *Aphytis* sp. at one location was >50%. *C. binotatus* was also found to prey on *A. tubercularis* and reproduce under the prevailing climatic conditions.

Lagowska, B. 1996. *Pulvinaria* Targioni-Tozzetti (Homoptera, Coccidae) in Poland. Wydawnictwo Akademii Rolniczej, Lublin, Poland. 119 pp.

Notes: Taxonomy, distribution, host plants, life history, economic importance, description of immature instars and adult female, biological study.

Lagowska, B. 1997. The effect of temperature on morphological characters in *Pulvinaria vitis* (L.) (Homoptera: Coccidae). Polskie Pismo Entomologiczne 66: 17-25.

Notes: Precise measurements of morphological characters of this species that are affected by air temperature; previous studies of this type are on *Parthenolecanium corni*, *Planococcus citri* and *Coccus hesperidum*.

Lagowska, B. & Koteja, J. 1996. Czerwce (Homoptera, Coccinea) Roztocza. (In Polish with summary in English). Fragmenta Faunistica 39: 29-42.

Notes: 88 species recorded from Ortheziidae, Margarodidae, Pseudococcidae, Eriococcidae, Cryptococcidae, Coccidae, Asterolecaniidae and Diaspididae families; 63 new to the region, four new to Poland, and one new to science; biology, ecology and zoogeographical aspects.

Leathwick, D.M. & Godfrey, P.L. 1996. Overwintering colonies of the common wasp *Vespula vulgaris* in Palmerston North, New Zealand. New Zealand Journal of Zoology 23: 355-358.

Notes: Overwintering by this wasp has been reported previously in beech (*Nothofagus*) forests containing honeydew from *Ultracoelostoma* spp. near Nelson, but not in urban areas of Nelson or Christchurch; honeydew is not available in urban Palmerston North and so cannot be a requirement for overwintering by *V. vulgaris*.

Li, S.J., Hou, K.W., Liu, F.S. & Zhao, H. 1997. Natural distribution, drought-resistant nature and moisture physiology of fine host trees for lac insects. (In CII). Forest Research 10:

519-524.

Notes: Study of natural distribution and biological characters of fine host trees of lac insects reveals six drought-resistant species of trees: *Albizia kalkora*, *Dalbergia obtusifolia* D. *szemaoensis*, *Pueraria wallichii*, *Moghania macrophylla* and *Ficus racemosa*. Moisture physiology indexes such as strength of transpiration, water potential, and water saturation deficit relate to comprehensive climate factors such as atmospheric temperature, intensity of illumination, relative humidity of atmosphere, and wind velocity. Strength of transpiration increases with the rise of temperature, intensity of illumination and wind speed or decreases with the rise of relative humidity of atmosphere. Variations of water potential are contrary to the change of strength of transpiration. The water potentials drop when strength of transpiration rises and capability to absorb water passively increases. Ability of drought resistance also rises. The larger the deficit of critical saturation, the smaller the water requirement and the stronger the drought hardiness.

Liu, Y.J. 1997. Species of the genus *Kermes* on *Castanea bungeana* Blume from China. (In Chinese). Entomological Knowledge 34: 93-94.

Notes: Species discussed include *Kermes flavus*, *K. nawae*, *K. castaneae*; key provided.

Liu, T. & Howell, J.O. 1997. *Helenococcus*, a new genus of Diaspididae with description of a new species, *Helenococcus hokeae* (Homoptera: Coccoidea) from Australia. Journal of Entomological Science 32: 72-78.

Notes: *Helenococcus*, a new genus of Diaspididae, is described and designated, including detailed illustrations and descriptions of the adult female, second instar, and first instar of the type species, *H. hokeae*; collected on *Hokea pampliniana* from New South Wales, Australia.

Lo, P.L., Blank, R.H. & Penman, D.R. 1996. Phenology and relative abundance of *Ceroplastes destructor* and *C. sinensis* (Hemiptera: Coccidae) on citrus in Northland, New Zealand. New Zealand Journal of Crop and Horticultural Science 24: 315-321.

Notes: The main scale insect pest in citrus orchards was *Ceroplastes destructor* although *C. sinensis* was more widespread; first and second instars vulnerable to adverse weather and predation and their longer duration in *C. sinensis* may partly account for its lower abundance; recommendations for timing of insecticides.

Loch, A.D. 1997. Natural enemies of pink wax scale, *Ceroplastes rubens* Maskell (Hemiptera: Coccidae), on umbrella trees in southeastern Queensland. Australian Journal of Entomology 36(3) :303-306.

Notes: The natural enemy complex of pink wax scale, *Ceroplastes rubens*, on umbrella trees, *Schefflera actinophylla*, in southeastern Queensland was investigated. An introduced encyrtid, *Anicetus beneficus*, was the major primary parasitoid, although high rates of hyperparasitisation by the native encyrtid *Coccidoctonus dubius* were recorded. Predators and other parasitoids were minor components of the natural enemy complex of *C. rubens*. Implications of this study's findings on the biological control of *C. rubens* in citrus by *A. beneficus* are discussed.

Loch, A.D. & Zalucki, M.P. 1996. Spatial distribution of pink wax scale, *Ceroplastes rubens* Maskell (Hemiptera: Coccidae), on umbrella trees in south-eastern Queensland: the pattern

- of outbreaks. Australian Journal of Zoology. Melbourne 44: 599-609.
- Notes: This scale is common on *Schefflera actinophylla*; highly aggregated distribution pattern found; scale infestation more prevalent in roadside positions and in exposed situations.
- Loch, A.D. & Zalucki, M.P. 1997. Variation in length, fecundity and survival of pink wax scale, *Ceroplastes rubens* Maskell (Hemiptera: Coccidae), on umbrella trees. Australian Journal of Zoology. Melbourne 45: 399-407.
- Notes: Factors that may lead to outbreaks of pink wax scale, *Ceroplastes rubens*, on umbrella trees, *Schefflera actinophylla*, were studied. Estimates of birth and death rates of *C. rubens* were high and variable within and among trees; variation in these rates was not related to pest density. Adult fecundity correlated significantly but weakly with adult test length; mean fecundity was 292 eggs per female with a range of 5-1178. Adult test length and its variance decreased weakly with increasing density. Field experiments conducted in Queensland showed that mortality of *C. rubens* is greatest during the first 24 hours after hatching when approximately 50% are lost. The rate of loss decreases over time with 0.3% of initial motile first-instar nymphs surviving to maturity. Rates of loss varied significantly between trees, indicating that some trees are more suitable for colonisation and survival.
- Maguire, A. 1997. Prickly pear in New South Wales. Agnote - NSW Agriculture No. DPI/179: 1 pp.
- Notes: The noxious weed status of all *Harrisia* and *Opuntia* spp. (except *O. ficus-indica*) in New South Wales is discussed; of 12 *Opuntia* spp. and 2 *Harrisia* spp. present, only *O. aurantiaca*, *O. stricta* var. *stricta* and *H. martinii* are currently considered problems in New South Wales. Control strategies are discussed; biological control by cochineal insect (*Dactylopius coccus*) on *Opuntia* and mealybug (*Hypogeococcus festerianus*) on *Harrisia* is the most widespread method, and measures to improve the spread of the insects and the efficacy of control are outlined. Under some climatic conditions biological control is not effective and the chemical and manual options that can be used instead are outlined.
- Malumphy, C. 1997. Laurel scale, *Aonidia lauri* (Bouche) (Homoptera: Coccoidea, Diaspididae), a pest of bay laurel, new to Britain. Entomologist's Gazette 48: 195-198.
- Notes: *Aonidia lauri* was observed infesting the leaves and bark of a laurel (*Laurus nobilis*) plant in Surrey, UK, during 1994. This is the 1st record of this insect in the UK.
- Malumphy, C.P. 1997a. 1.2.2 Honeydew. 1.2.2.1 Morphology and anatomy of honeydew eliminating organs. Pp. 452 pp. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
- Notes: Covers definition of honeydew, harmful effects, disposal, and morphology, anatomy and elimination mechanism of the anal apparatus of Coccidae; illustrated; mentions *Saissetia zanzibarensis*, *Coccus viridis*, *Pulvinaria vitis*, *P. iceryi*, *Halococcus formicarii*, *Megapulvinaria maxima* and the genera *Physokermes*,

Filippia, *Kilifia*, *Milviscutulus*, *Protopulvinaria*, *Udinia*, *Cryptostigma*, *Drepanococcus*, *Pseudopulvinaria*, *Austrolichtensia*, *Alecanochiton*, *Megapulvinaria*, *Paractenochiton*, *Udinia*, *Melanococcus*, *Pulvinarisca*, *Psilococcus* and *Rhodococcus*.

Malumphy, C. 1997b. Imperfect mealybug, *Phenacoccus defectus* Ferris (Homoptera: Coccoidea, Pseudococcidae), a pest of succulent ornamental plants, new to Britain. Entomologist's Gazette 48: 285-288.

Notes: *Phenacoccus defectus* is recorded for the 1st time in Britain, having been collected from leaf-rosettes of *Echeveria craigiana*, *E. lurida*, *E. recurvata*, *E. sessiliflora* and *Echeveria* sp. on 5 November 1995. The infestation was most persistent on *E. lurida*. Notes on the biology of this pest are given.

Mani, E. & Baroffio, C. 1997. [Biological control of the San Jose scale in Zug Canton with the parasitic wasp *Encarsia perniciosi*.] Biologische Bekämpfung der San-Jose-Schildlaus im Kanton Zug mit der Schlupfwespe *Encarsia perniciosi*. (In German). Obst- und Weinbau 133: 392-394.

Notes: Control of San Jose scale (*Quadraspidiotus perniciosus*) in old fruit trees with rough bark in Switzerland using mineral oil was ineffective, so biological control on apple and plum using the parasitoid *Encarsia perniciosi* was investigated during 1994-96. The percentage parasitism of *Q. perniciosus* increased from approx equal to 20% in 1995 to approx equal to 75% in 1997, and the number of males of *Q. perniciosus* (caught in pheromone traps in the centre of the release site) fell from approx equal to 2500 in 1994 to almost zero in 1996.

Mani, M. & Krishnamoorthy, A. 1996. *Aonidiella orientalis* (Newstead) (Diaspididae, Homoptera) and its natural enemies found on Sapota, Ber, Custard apple and banana. Entomon 21: 273-274.

Notes: The oriental yellow scale *Aonidiella orientalis* Newstead) was reported for the first time on Sapota. Natural enemies were collected on *A. orientalis* but they were inadequate to check the oriental scale.

Mani, M. & Krishnamoorthy, A. 1996. Biological suppression of oriental mealybug, *Planococcus lilacinus* (Ckll.) on ber. Pest Management in Horticultural Ecosystems 2: 49-50.

Notes: Host *Zizyphus maritiana*; natural enemy *Spalgis epius* also attacks *Ferrisia virgata* and *Maconellicoccus hirsutus*.

Mani, M. & Krishnamoorthy, A. 1996a. Discovery of the coccinellid predator *Chilocorus circumdatus* on the green scale *Coccus viridis*. Entomon 21: 295-296.

Notes: The coccinellid *Chilocorus circumdatus* Sch. was discovered for the first time in large number preying on the green scale *Coccus viridis* (Green) infesting acid lime in 1994 around Bangalore. The predation lime by *C. circumdatus* along with *Chilocorus nigrita* (F.) had resulted in the effective suppression of the scale population on acid lime.

Mani, M. & Krishnamoorthy, A. 1997. Effects of different pesticides upon the wax scale parasitoid, *Anicetus ceylonensis* How. (Hym.: Encyrtidae). International Journal of Pest Management 43: 123-126.

Notes: *Drepanococcus chiton* has become a serious pest of *Zizyphus mauritiana* and

Psidium guajava in recent years in India; *Anicetus ceylonensis* has been somewhat effective in suppressing this scale on both crops; 17 insecticides evaluated for control of scale with least harm to *A. ceylonensis*.

Manzella, S. 1997. [Protection of citrus from insects, mites, fungi and other damaging organisms.] Difendiamo l'agrumeto da insetti, acari, funghi ed altri organismi dannosi. (In Italian). Vita in Campagna 15: 25-30.

Notes: Cultural, biological and chemical control strategies for use against insect pests, mites and plant pathogens of Citrus in Italy are described. The pests discussed include scale insects *Planococcus citri* and *Aonidiella aurantii*.

Marohasy, J. 1997. Acceptability and suitability of seven plant species for the mealybug *Phenacoccus parvus*. Entomologia Experimentalis et Applicata 84(3): 239-246.

Notes: Survival, development and fecundity of cohorts of the mealybug *Phenacoccus parvus* Morrison were measured over one generation on seven plant species representing four plant families. Survival, development and fecundity were not significantly higher on the mealybug's principal field host, the weed *Lantana camara* L. (Verbenaceae), than on other plant species including *Lycopersicon esculentum* Miller (tomato) and *Solanum melongena* L. (eggplant). The acceptability of the leaves of the seven plant species to *P. parvus* first instar crawlers was measured on hatching, after active walking and after food deprivation, *Lantana camara* was the highest ranked plant species for all treatments. The number of crawlers settling on lower ranked plant species increased with the level of food deprivation.

Marotta, S. 1997. 1.2 Biology. 1.2.1.1 General life history. Pp. 251-256. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Topics covered are first-instar nymph or crawler, subsequent immature instars, adult female and egg; species mentioned include: *Ceroplastes floridensis*, *C. japonicus*, *C. sinensis*, *Coccus capparadis*, *C. hesperidum*, *Filippia follicularis*, *Lichtensia viburni*, *Parthenolecanium corni*, *Pulvinariella mesembryanthemi*, *Sphaerolecanium prunastri* and *Toumeyella pinicola*.

Marotta, S. & Tranfaglia, A. 1997. 1.3.4. Seasonal history; diapause. pp. 343-350. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 343-350.

Notes: Covers voltinism and diapause; species mentioned include *Ceroplastes floridensis*, *C. hesperidum*, *C. pseudoceriferus*, *C. sinensis*, *Coccus hesperidum*, *C. pseudomagnoliarum*, *Eulecanium tiliae*, *Neopulvinaria innumerabilis*, *Parthenolecanium corni*, *P. persicae*, *Physokermes hemichryphus*, *Pulvinaria vitis*, *Saissetia oleae* and *Sphaerolecanium prunastri*.

Matile-Ferrero, D. 1997. 1.1.2 Morphology. 1.1.2.1 The adult female. Pp. 5-21. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: General structure, margin, ventral and dorsal surfaces; mentions more than 65 genera or species.

Mazzeo, G., Russo, A. & Longo, S. 1997. [New records on Sicilian scale insects fauna (Homoptera, Coccoidea).] Nuovi reperti sulla coccidofauna Siciliana (Homoptera, Coccoidea). (In Italian with summary in English). Bollettino della Società Entomologica Italiana. Firenze 129: 19-23.

Notes: Six species of coccoids are reported, three of which (*Phenacoccus interruptus*, *Spilococcus mamillariae* and *Trionymus perrisii*) are new to the Sicilian fauna.

Mazzoni, E. 1996. Antennal sensilla of *Pseudaulacaspis pentagona* male (Targioni-Tozzetti) (Homoptera: Diaspididae). (In English with summary in Italian). Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'. Portici 52: 43-55.

Notes: Studies using light microscopy and scanning electron microscopy; Sensilla campaniforma, coeloconica, basiconica and trichodea were found; five forms of sensilla trichodea were identified, distinguishable by dimensions and/or by the presence of multiporous walls.

McComie, L.D., Gosine, S. & Siew, P. 1997. The effect of *Cryptolaemus montrouzieri* (Mulsant) on the hibiscus mealybug *Maconellicoccus hirsutus* (Green), on hibiscus plants in Trinidad. Tropical Fruits Newsletter No. 23: 7-10.

Notes: After field releases in May and July, 1996, in Port of Spain, Trinidad, of *Cryptolaemus montrouzieri* for control of *Maconellicoccus hirsutus* on ornamental hibiscus (*Hibiscus rosa-sinensis*), the pest population continued to increase for 4 weeks after the release. From 8 to 20 weeks after the release, fluctuations of the population continued, although at decreasing levels. The population of the control agent declined for the first 2 weeks, then increased to a peak of 6 weeks after release. The predator population declined at about the same time as the pest.

Mendel, Z., Adar, K., Nestel, D. & Dunkelblum, E. 1997. Sex pheromone traps as a tool for the study of population trends of the predator of a scale insect and for the identification of potential predators for biological control. Bulletin OILB/SROP (Sect. Reg. Ouest Palearctique) 20: 231-240.

Notes: Technology transfer in mating disruption. Proceedings of a working group meeting in Montpellier, France, on 9-10 September 1996. The capture of adults of *Elatophilus hebraicus* in traps baited with the sex pheromone (56:44 mixture of (2E, 6E, 8E)-5,7-dimethyl-2,6,8-decatrien-4-one and (2E,6Z,8E)-5,7-dimethyl-2,6,8-decatrien-4-one) of *Matsucoccus josephi* enabled the study of population trends of both species. Traps were exposed at monthly intervals in stands of *Pinus halepensis* and *P. brutia* ssp. *brutia* in Israel during 1993-95. The population density of *M. josephi* increased in March-April and in August and October. A steep increase in trap catch of *E. hebraicus* was noticeable during May and June. The rise of the predator population was positively related, but only to a limited extent, to the increase in prey density in the previous spring. On an annual basis, an inverse relationship was found between the mean densities of *M. josephi* and *E. hebraicus*. Population trends of both prey and predator varied slightly between regions, but not between host plant species. Pheromone traps were used in additional areas of the Palaearctic region where other *Matsucoccus* species occur. It was found that the range of *E. hebraicus* and *M. josephi* coincides with

that of *P. brutia* ssp. *brutia* in the East Mediterranean. In *P. pinaster* stands in Portugal, two other predators, *E. crassicornis* and *Hemerobius stigma* were caught in traps baited with *M. josephi* pheromone.

M'Hamed, T.B. & Chemseddine, M. 1996. Laboratory study of some biological potentialities of *Pullus mediterraneus* (Col., Coccinellidae). *Entomophaga* 41: 59-62.

Notes: Some biological potentialities of *Pullus mediterraneus* (Coleoptera, Coccinellidae) were studied under controlled conditions. Eggs were laid under carapaces of *Saissetia oleae*, which is an important pest of olive trees in Morocco. The eclosion of eggs occurred after more than 36 days at 7 deg C, but no more than 1.7 days at 30 deg C. The eclosion rate of eggs exceeded 80% between 20 and 30 deg C. In homogeneous juvenile populations fed with aphids, 4 instars were distinguished on the basis of the width of the cephalic capsule. Mortality rate was low at all temperatures tested. It did not exceed 25% at 20 deg C and decreased considerably at 30 deg C when *S. mediterraneus* fed on aphids.

Mibey, R.K. 1997. 1.2.2 Sooty moulds. Pp. 275-290. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Covers taxonomy of sooty moulds, occurrence and distribution, early observations, host plant - sooty mould interactions, insect - sooty mould interactions, and effects of sooty mould on host plants; table of sooty mould fungi associated with honeydew of Coccoidea gives scale insect, location, effect on plant and reference.

Miller, D.R. & Hodgson, C.J. 1997. 1.1.3.7 Phylogeny. Pp. 229-250. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Review of previous partial cladistic analyses of Coccoidea; justification for using occasional male or first instars as exemplar taxon; resulting cladograms; appendices show sources of the characters and character-states, list of characters and character-states, and character state changes.

Miller, D.R. & Polavarapu, S. 1997. A new species of mealybug in the genus *Dysmicoccus* (Hemiptera: Coccoidea: Pseudococcidae) on importance in highbush blueberries (*Vaccinium corymbosum*, Ericaceae) in the eastern United States. *Proceedings of the Entomological Society of Washington* 99: 440-460.

Notes: A new species of mealybug, *Dysmicoccus vaccinii* Miller and Polavarapu, is described that is believed to be a pest of highbush blueberries, *Vaccinium corymbosum* L. It has an unusual life history since most instars can be found in the field throughout the year, including January and February. The four female instars and five male instars are described and illustrated, including apterous and macropterous adult males. The blueberry mealybug is suggested as a common name. New synonymy is included as follows: *Dysmicoccus bispinosus* Beardsley is considered to be a junior synonym of *D. texensis* (Tinsley).

Miller, D.R. & Williams, D.J. 1997. A new species of mealybug in the genus *Pseudococcus* (Homoptera: Pseudococcidae) of quarantine importance. *Proceedings of the Entomological*

- Society of Washington 99: 305-311.
- Notes: *Pseudococcus odermatti*, new sp., described; taken in quarantine on *Aglaonema*, *Citrus*, and other plants; key provided.
- Miller, G.L. & Williams, M.L. 1997. 1.1.2.3 The male test. Pp. 49-54. in: Ben-Dov, Y. & Hodgson, C.J. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
- Notes: Discussion of appearance with illustrations; 66 species mentioned.
- Mishra, Y.D., Bhattacharya, A., Singh, B.P. & Agarwal, S.C. 1996. Occurrence of trivoltine lac insects on *Samania saman* (Jacq.) Merr. in coastal West Bengal. Insect Environment 2: 54-55.
- Notes: The first occurrence of three generations of *Kerria* sp. in a year was recorded in the Midnapur district of West Bengal, India. The insect thrived on *Sammania saman* (*Albizia saman*), a fast-growing shade tree.
- Mishra, Y.D., Bhattacharya, A. & Sushil, S.N. 1997. Effect of some systemic fungicides on the nymphs of Indian lac insect, *Kerria lacca* (Kerr.), for their protection against fungal infection. Journal of Entomological Research. New Delhi 21: 291-293.
- Notes: Measures for the control of fungal infections in cultures of *Kerria lacca* were determined using fungicides. Carbendazim (at 125, 250 and 500 ppm) and aureofungin (at 50, 100 and 200 ppm) were evaluated on the kusmi strain of *K. lacca* under laboratory conditions. A highly significant reduction in the mortality of second-instar nymphs was recorded at all fungicide concentrations. Nymphal mortality was reduced by 82.9% by aureofungin and 75.4% by carbendazim, even at the lowest concentrations. The reduction in mortality was attributed to a suppression of several saprophytic and possibly some entomogenous fungi associated with *K. lacca*.
- Mohammad, Z.K., Mohammad, S.K. & Mohammad, M.A. 1997. Taxonomic studies and survey of four families of Coccoidea (Homoptera) in Egypt. Journal of the Egyptian German Society of Zoology 22: 189-233.
- Notes: The first and second female nymphal instars of six species of scale insects under four genera belonging to four families: Asterolecaniidae, Cerococcidae, Eriococcidae and Phoenicococcidae; collected on thirteen species of host plants in Egypt; descriptions; illustrations; keys.
- Morgan, D.J.W. & Hare, J. D. 1997. Uncoupling physical and chemical cues: the independent roles of scale cover size and kairomone concentration on host selection by *Aphytis melinus* DeBach (Hymenoptera: Aphelinidae). Journal of Insect Behavior 10: 679-684.
- Notes: The aphelinid ectoparasitoid *Aphytis melinus* initially selects its host, the California red scale, *Aonidiella aurantii*, using characteristics of the hosts cover before assessing the quality of the body beneath. Host suitability is known to increase with host size until *A. aurantii* reaches maturity, after which it is no longer available for parasitism. *Aphytis melinus* uses a combination of scale cover size and a kairomone, O-caffeoyltyrosine, in the cover for initial assessment.
- Mourier, M. 1997. Effects of neem (*Azadirachta indica*) kernel water extracts on cassava mealybug, *Phenacoccus manihoti* (Hom., Pseudococcidae). Journal of Applied

Entomology 121: 231-236.

Notes: The effect of neem kernel water extract (NKWE) in different concentrations on *Phenacoccus manihoti* was investigated in the laboratory at 23 deg C and in a greenhouse on cassava. A choice-test showed that neem-treated cassava leaves were less attractive to 1st-instar nymphs than untreated leaves. Pseudococcids that started feeding on treated leaves died in the 2nd instar. A greenhouse experiment showed that three applications of NKWE at weekly intervals protected cassava against established early-instar nymphs. There were no significant differences between concentrations of 1, 10 and 25%. All concentrations were phytotoxic to varying degrees.

Mugo, H.M. 1996. Laboratory studies of the life history of ladybird beetle, *Chilocorus nigripes* Mader (Coleoptera: Coccinellidae). Kenya Coffee 61: 2207-2209.

Notes: *Coccus alpinus* was host of this beetle for this experiment.

Mugo, H.M. 1996. Biological control of green and fried egg scales in coffee by ladybird beetles. Kenya Coffee 61: 3123-2317.

Notes: Three species of coccinellids (*Chilocorus nigripes*, *C. angolensis* and *Hyperaspis senegalensis*) were studied in the laboratory to determine their host preference with respect to 2 major species of coffee scales (*Coccus alpinus* and *Aspidiotus* sp.). Combinations of 100-120 scales of each species, with 8 coccinellids of each species were designated, and the predation rate noted. The mean predation rates by *Chilocorus angolensis* and *C. nigripes* on *Coccus alpinus* were not significantly different from each other, but were significantly higher than that of *Hyperaspis senegalensis*. All predators differed significantly among each other with regard to their predation rate on *Aspidiotus* sp. Three clear stages in the development of all coccinellids could be identified, which are referred to as introduction (1-3 weeks), adaptation (3-8 weeks) and establishment (week 8 onwards) phases. Heaviest predation rates occurred between week 3 and 31, after which time there was a slight decline.

Murdoch, W.W., Briggs, C.J. & Nisbet, R.M. 1996. Competitive displacement and biological control in parasitoids: a model. American Naturalist 148: 807-826.

Notes: *Aonidiella aurantii* is controlled to varying degrees in many areas by parasitoids of *Aphytis* spp., such as *A. lingnanensis* and *A. melinus*; stage-structured parasitoid-host model presented to account for competitive displacement of *A. lingnanensis* in a short time and improvement in biological control; effects of other model parameters examined and implications discussed for a predictive theory of biological control.

Murphy, S.T. 1997. 3.3.14 Coffee. pp. 367-380. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Species of Coccidae recorded on coffee and their distribution include *Alecanochiton*, *Avricus arborescens*, *Ceroplastes brevicauda*, *C. destructor*, *C. galeatus*, *C. personatus*, *C. rubens*, *C. vinsonioides*, *Chloropulvinaria psidii*, *Coccus africanus*, *C. alpinus*, *C. asiaticus*, *C. brasiliensis*, *C. celatus*, *C.*

colemanni, *C. hesperidum*, *C. lizeri*, *C. longulus*, *C. subautus*, *C. subhemisphaericus*, *C. viridis*, *C. viridulus*, *Cryptostigma inquilina*, *Paralecanium marianum*, *Parasaissetia nigra*, *Protopulvinaria longivalvata*, *Pulvinaria aethiopica*, *P. mammeae*, *Saissetia coffeae*, *S. neglecta*, *S. oleae*, *S. privigna*, *S. zanzibarensis*, *Toumeyella* sp., *Udinia glabra* and *Vinsonia stellifera*; distribution; references; economic importance; control measures; natural enemies.

Murthy, G.R. & Babu, T.R. 1996. Seasonal fluctuation of mealybug population on custard apple and grape. *Journal of Research APAU* 24: 87-91.

Notes: Field studies were carried out during 1995-96 in Andhra Pradesh, India, to investigate the fluctuations in *Maconellicoccus hirsutus* populations in grapes and *Annona reticulata*. The greatest populations were found in grapes during the first half of July (vegetative phase) and during the 2nd half of March (reproductive phase), and in *A. reticulata* in June. An increase of *M. hirsutus* in grapes resulted in a decrease in *A. reticulata*.

Mushongahande, M. 1996. Scale insect *Aspidoproctus* sp. nr. *A. glaber* Lindiger): a cause for concern to Zimbabwe's indigenous forests. *Zimbabwe Science News* 30: 61-64.

Notes: Notes are given on the biology and ecology of *Aspidoproctus* sp. nr. *A. glaber* which is associated with the widespread mortality of indigenous trees in 3 districts of north-western Zimbabwe. These massive tree deaths were probably caused by drought and insect attack was only secondary. The symptomatology of damage, probable causes of the problem and management options are discussed.

Myers, J.H., Savoie, A. & van Randen, E. 1998. Eradication and pest management. *Annual Review of Entomology* 43: 471-491.

Notes: *Parlatoria blanchardi*, the date palm scale, mentioned as an eradication project.

Nafus, D.M. 1996. An insect survey of the Marshall Islands. (In English with summary in French). Technical Paper of the South Pacific Commission No. 208: 1-35.

Notes: *Aspidiotus destructor* identified as a major problem on coconut and breadfruit; other scales discussed include *Aonidiella aurantii*, *Aonidiella inornata*, *Ceroplastes rubens*, *Chloropulvinaria psidii*, *Coccus hesperidum*, *Dysmicoccus brevipes*, *D. cocotis*, *D. neobrevipes*, *Furcaspis oceanica*, *Icerya aegyptiaca*, *I. purchasi*, *Lepidosaphes beckii*, *L. esakii*, *Palmiculttor palmarum*, *Parasaissetia nigra*, *Pinnaspis strachani*, *Planococcus citri*, *P. pacificus*, *Pseudaulacaspis pentagona*, *Pseudococcus orchidicola*, *Pulvinaria urticae*, *Saissetia coffeae* and *S. neglecta*.

Nault, L.R. 1997. Arthropod transmission of plant viruses: a new synthesis. *Annals of the Entomological Society of America* 90: 521-541.

Notes: More than 380 viruses from 27 plant virus genera are transmitted from the Homoptera; Pseudococcidae are mentioned for their role in transmitting the reovirus *Badnavirus* and the closterovirus *Closterovirus* and *Trichovirus*.

Neuenschwander, P. 1996. Evaluating the efficacy of biological control of three exotic homopteran pests in tropical Africa. *Entomophaga* 41: 405-424.

Notes: Proceedings of the global IOBC/OILB conference on Technology transfer in biological control. From research to practice. Montpellier, France, September 1996. Techniques for evaluating biological control of *Phenacoccus manihoti*,

Rastrococcus invadens and *Aleurodicus dispersus* in tropical Africa are described. In each case, two exotic hymenopterous parasitoids were introduced, which controlled the pest species, with indigenous and exotic coccinellids playing a minor role. Control was achieved in large areas where the exotic parasitoid(s) had been present for more than 2-4 years.

Notte, P. la, Buzkan, N., Choueiri, E., Minafra, A. & Martelli, G.P. 1997. Acquisition and transmission of grapevine virus A by the mealybug *Pseudococcus longispinus*. *Journal of Plant Pathology* 78: 79-85.

Notes: Evidence indicates that *P. longispinus* instars transmit GAV in a semi-persistent manner; they acquired GAV in as little as 15 minutes when feeding on *Nicotiana clevelandi* or 12 hours when feeding on purified virus preparations through a membrane; they retained the virus from up to 48 hours when fasting, but no longer than 15 hours when allowed to feed on herbaceous hosts following serial transfers; they were able to transmit GAV to healthy plants with no latent period, after a 30 minute feeding (the shortest inoculation access time tested); preliminary survey of populations of different mealybug species collected in the vineyards of Mediterranean countries showed that 77% contained GAV and 33% contained grapevine leafroll-associated 3 (GLRaV-3); many samples, including a population of *Ceroplastes rusci* from Tunisia, contained both viruses.

Obrycki, J.J. 1998. Predaceous Coccinellidae in biological control. *Annual Review of Entomology* 43: 295-321.

Notes: Coccinellidae are important natural enemies of pest species, including mealybugs and scales; example given on successful biological control of cottony-cushion scale by *Rodolia cardinalis*; *R. cardinalis* also released against *Icerya purchasi*; three *Chilocorus* spp. mentioned against *Aonidiella aurantii*.

Ofek, G., Huberman, G., Yzhar, Y., Wysoki, M., Kuzlitzky, W. & Reneh, S. 1997. The control of the oriental red scale, *Aonidiella orientalis* Newstead and the California red scale, *A. aurantii* (Maskell) (Homoptera: Diaspididae) in mango orchards in Hevel Habsor (Israel). (In Hebrew with summary in English). *Alon Hanotea* 51: 212-218.

Notes: Distribution of *Aonidiella orientalis* in Israel; description of damage; host plants include olives, guava, feijoa, litchi, Acacia and avocado; has been found associated with *A. aurantii*; careful monitoring of pest populations and control measures using mineral oils according to infestation levels and appearance of the different development stages led to a drastic reduction in the pest population, an increase in the population of natural enemies and the restoration of the biological equilibrium; several natural enemies were identified; among them were the parasitoids *Comperiella bifasciata*, *Habrolepis aspidioti*, *Aphytis melinus*, *A. lingnanensis* and *Encarsia* sp.; the hyperparasitoids *Marietta javensis* (*M. leopardina*), *Ablerus guadrui*, and *Zaomma* sp.; the predators *Stethorus gilvifrons*, *Chilocorus bipustulatus*, *Chrysoperla carnea*, and the parasitic mite *Hemisarcophyes coccophagus*. Additionally *Comperiella lemniscata*, a parasitoid of *A. orientalis*, and two predatory coccinellids, *Chilocorus circumdatus* and *C. baileyi*, were introduced into Israel from Australia.

- Omkar & Bind, R.B. 1996. Record of aphids -- natural enemies complex of Uttar Pradesh. V. The Coccinellids. *Journal of Advanced Zoology* 17: 44-48.
Notes: *Micraspis* sp. recorded feeding on Pseudococcidae.
- Orphanides, G.M. 1996. Establishment of *Comperiella bifasciata* (Hym.: Encyrtidae) on *Aondidiella aurantii* (Hom.: Diaspididae) in Cyprus. *Entomophaga* 41: 53-57.
Notes: Rearing, colonization and establishment of *C. bifasciata* to improved effectiveness of biological control of California red scale in Cyprus.
- Paloukis, S.S. & Navrozidis, E.I. 1996. Integrated control of *Pseudauleacaspis pentagona* (Targ. Tozz.) (Homoptera, Diaspididae) on peach and kiwi trees in northern Greece. (In English with summary in Italian). *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'*. Portici 52: 111-116.
Notes: Control of this serious pest utilizes insect growth regulators and insect growth inhibitors against first-generation crawlers, mineral oils, which lessens damage to *Encarsia berlesei*, a natural enemy; other predators and parasitoids also observed: *Cybocephalus rubifrons*, *Lindorus lophanthae*, *Chilocorus bipustulatus* and *Aphytis diaspidis*.
- Pandya, H. V. 1997. Control of sugarcane borers, mealy bugs and scale insects in Gujarat. *Cooperative Sugar* 28: 745-746.
Notes: An investigation on the control of sugarcane borers (*Scirpophaga excerptalis*, *Chilo infuscatellus*, *Emmalocera depressella* (*Polyocha depressella*), *Chilo sacchariphagus* and *Chilo auricilius*), mealy bugs (*Saccharicoccus sacchari*) and scale insects (*Melanaspis glomerata*) through insecticides in Gujarat. An experiment in a randomised block design with 25 treatments replicated twice, was conducted at Navsari and Madhi, Gujarat, India in 1993. The results revealed that minimum incidence of *S. excerptalis* (1.82%), *P. depressella* (2.07%), *Chilo auricilius* (2.48%), *C. sacchariphagus indicus* (2.71%) and *M. glomerata* (8.28%) was recorded in the treatment of phorate 10 G at 1 kg ai/ha applied three times. The minimum incidence of *S. sacchari* (0.40%) and the highest cane yield (137.36 t/ha) was recorded in the treatment of carbofuran 3 G at 1 kg ai/ha applied three times.
- Paulian, R. 1997. Raymond Mamet (8 mars 1912 - 1re septembre 1996) liste de ses publications. (In French). *Bulletin de la Société Entomologique de France* 102: 5-10.
Notes: About half of his publications cover scale insects.
- Pellizzari-Scaltriti, G. 1997. 3.3.2 Olive. Pp. 217-229. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
Notes: Notes on *Saissetia oleae*, *S. coffeae*, *Lichtensia viburni* and *Filippia follicularis*.
- Pellizzari-Scaltriti, G. 1997a. 3.3.9 Grapevine. Pp. 323-331. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
Notes: Notes on pests, *Pulvinaria vitis*, *Neopulvinaria innumerabilis*, *Parthenolecanium persicae*, *P. corni*; occasional pests *Ceroplastes rusci*, *Coccus hesperidum*, *Mesolecanium uvicola*, *Neolecanium silveirai*, *Saissetia oleae* and *S. coffeae*.

Pellizzari-Scaltriti, G. & Fontana, P. 1996. Contribution to the knowledge of Homoptera Coccoidea of Sardinia with description of a new species. (In English with summary in Italian). Bollettino di Zoologia Agraria e Bachicoltura. Milano 28: 119-140.

Notes: 46 species collected; *Acanthococcus acutus*, *Eulecanium ericae*, new comb., *Rhizopulvinaria maritima* and *Aonidia mediterranea* recorded for the first time in Italy; *Dysmicoccus kozari*, new sp., collected on *Convolvulus* sp., described and illustrated.

Perruso, J.C. & Cassino, P.C.R. 1997. Presence-absence sampling plan for *Selenaspidus articulatus* (Morg.) (Homoptera: Diaspididae) on citrus. (In Portuguese). Anais da Sociedade Entomologica do Brasil 26: 321-326.

Notes: The efficiency of a binomial sampling (presence-absence) technique for *Selenaspidus articulatus* (Morg.) in citrus orchards was evaluated. The spatial distribution of scales was aggregated, according to Taylor's law power coefficients ($b = 1,636$; $a = 5,772$). Regression analysis between the estimated proportion of infected leaves, resulted in a high determination coefficient, explaining 85,4% of the model. The number of sample unities (leaves) required to estimate infestation density was low, allowing practical application of this methodology to monitor *S. articulatus* populations.

Petersen, C.L. & Charles, J.G. 1997. Transmission of grapevine leafroll-associated closteroviruses by *Pseudococcus longispinus* and *P. calceolariae*. Plant Pathology 46: 509-515.

Notes: The transmission of two closteroviruses associated with grapevine leafroll, GLRaV-1 and GLRaV-3, from grapevine to grapevine by the mealybugs, *Pseudococcus longispinus* and *P. calceolariae* (Homoptera: Pseudococcidae) was studied. Controlled transmission experiments using the first and third instars of each insect were conducted twice during the 1993-94 growing season to investigate the consequence of virus accumulation within the donor vine leaf tissue on the incidence of virus transmission to healthy recipient vines. Transmission of GLRaV-1 and GLRaV-3 was determined by ELISA testing recipient vines in July 1994 and March 1995. GLRaV-3 was transmitted to recipient vines by *P. longispinus* and *P. calceolariae* first instars only. An increase in virus titre within the season did not significantly alter the transmission rate of GLRaV-3 by either *P. longispinus* or *P. calceolariae* first instars. *P. longispinus* and *P. calceolariae* failed to transmit GLRaV-1 to recipient vines.

Peveling, R. & Demba, S.A. 1997. Virulence of the entomopathogenic fungus *Metarhizium flavoviride* Gams and Rozsypal and toxicity of diflubenzuron, Fenitrothion-Esfenvalerate and Profenofos-Cypermethrin to nontarget arthropods in Mauritania. Archives of Environmental Contamination and Toxicology 32: 69-79.

Notes: The beneficial *Pharoscymnus anchorago*, a natural enemy of scale insects in date palms, was considered most at risk in the course of chemical locust control. It was concluded that the use of mycopesticides to control desert locust in date palm plantations offers an environmentally safe and economically viable alternative to chemical control.

- Pfeiffer, D.G. 1997. 3.3.8 Deciduous fruit trees. Pp. 293-322. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Notes on major pest species, *Mesolecanium nigrofasciatum*, *Parthenolecanium corni*, *P. persicae* and *Sphaerolecanium prunastri*; summary of host and distribution data on minor pest species; natural enemies recorded; biological and chemical control.
- Podsiadlo, E. 1997. Morphology of the first instar of *Quadraspidiotus zonatus* (Frauenfeld) (Homoptera, Coccinea, Diaspididae). *Annales Zoologici* (Warsaw) 46: 193-200.
- Notes: Descriptions and illustrations; hosts include *Quercus*, *Fagus*, *Juglans* and *Fraxinus*.
- Pollard, G. 1997. Update on new pest introductions in the Caribbean. *CARAPHIN News* No. 15: 1018-1210.
- Notes: Introduction of *Maconellicoccus hirsutus* into various countries in the Caribbean.
- Ponsonby, D.J. & Copland, M.J. 1996. Effect of temperature on development and immature survival in the scale insect predator, *Chilocorus nigritus* (F.) (Coleoptera: Coccinellidae). *Biocontrol Science and Technology* 6: 101-109.
- Notes: This economically important predator of wide range of scale insects species on citrus, sugar cane, coconut and other crops in tropical and subtropical regions; reared on *Abgrallaspis cyanophylli* cultured on *Solanum tuberosum*.
- Ponsonby, D.J. & Copland, M.J.W. 1997. 2.2.1 Coccinellidae and other Coleoptera. Pp. 29-60. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: 74 coccidae hosts mentioned.
- Poole, R.W. & Gentili, P. (Eds.) 1997. *Nomina Insecta Nearctica. A Check List of the Insects of North America. Volume 4: Non-Holometabolous Orders*. Entomological Information Services, Rockville, MD. 731 pp.
- Prinsloo, G.L. 1996. The genus *Comperiella* Howard (Hymenoptera: Encyrtidae) in southern Africa: parasitoids of armoured scale insects (Homoptera: Diaspididae). *African Entomology* 4: 153-160.
- Notes: Hosts include *Aonidiella aurantii*, *A. orientalis*, *Chrysomphalus aonidium* and *C. dictyospermi*.
- Prinsloo, G.L. 1996a. *Neastymachus dispar* sp.n. (Hymenoptera: Encyrtidae), a parasitoid of *Cribrolecanium andersoni* (Newstead) (Homoptera: Coccidae) on citrus in southern Africa. *African Plant Protection* 2: 117-120.
- Notes: This white powdery scale, or Andersoni scale, is indigenous to the Afrotropical Region; found on variety of indigenous plants and cultivated subtropical fruit crops; main damage caused to citrus is in production of honeydew, which serves as substrate for sooty mould fungi.
- Prinsloo, G.L. 1997. 2.3.1 Encyrtidae. Pp. 69-109. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Discusses the role of encyrtids as natural enemies of soft scales; hosts mentioned

include *Ceroplastes rubens*, *Pulvinaria psidii*, *Coccus hesperidum*, *C. pseudomagnoliarum*, *C. viridis*, *Eulecanium tiliae*, *Ceroplastes destructor*, *Parasaissetia nigra*, *Parthenolecanium corni*, *P. persicae*, *Pulvinaria delottoi*, *Pulvinariella mesembryanthemi*, *Saissetia coffeae* and *S. oleae*.

Priore, R., Marotta, S. & Sollino, G. 1996. [The life cycle of *Marchalina hellenica* (Gennadius) (Homoptera Coccoidea Margarodidae) on *Pinus* spp. in the island of Ischia.] Ciclo biológico di *Marchalina hellenica* (Gennadius) su *Pinus* spp. nell'isola di Ischia. (In Italian with summary in English). Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'. Portici 52: 35-41.

Notes: *M. hellenica* is a scale insect harmful to the pine trees of the island of Ischia (Naples). This species shows one generation per year and overwinters in the female third instar sheltered under the scale and/or in the bark crevices. The adult female appears at the beginning of March; the oviposition takes place at the end of the same month. The crawlers are present from mid May until through September. The species is surely parthenogenetic, because male stages have not been found. Some criteria for the chemical control are also discussed.

Qin, T.K. 1997. 1.2.3.2 The pela wax scale and commercial wax production. Pp. 303-321. in: Ben-Dov, Y. & Hodgson, C.J. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Topics are history and study of *Ericerus pela*, geographical distribution, commercial wax production regions in China, life cycle, biology, host plants, natural enemies, wax secretion and wax glands, processes of commercial production of wax, products, and usage; wax production of *Ceroplastes* spp.

Ramadevi, O.K., Raja Muthukrishnan, Rao, A.R., Vivaramakrishnan, V.R. & Santhakumaran, L. N. 1997. Epidemic outbreak of lac insect, *Kerria lacca* (Kerr.), on *Santalum album* (sandal) and its control. Indian Forester 123: 143-147.

Notes: An epidemic outbreak is reported of *Kerria lacca* on *Santalum album* and its host trees (*Pongamia pinnata* and *Casuarina equisetifolia*) at Gottipura and Nallal in the Hoskote range of Karnataka, in December-January 1994-95. Some 24.5% of the trees were heavily affected (9.3% of them dead), 25.5% had medium attack and 50% were free of the pest. To control the lac infestation, the affected branches were lopped off, burnt and the insecticide Ekalux 20AF ((quinalphos) 0.5% mixed with 0.05% sticker) was sprayed onto the trees. The treated trees were watered. This has completely controlled the lac infestation on sandal. A second spray, with insecticides such as Rogor 30 EC (dimethoate), fenvalerate, cypermethrin or dimethoate, could be applied after formation of the new flush of leaves, to check further secondary infection.

Renard, S., Lognay, G., Le Ru, B., Marlier, M. & Gaspar, C. 1996. Host selection behaviour by the cassava mealybug *Phenacoccus manihoti* Matile-Ferrero (Homoptera, Pseudococcidae): Potential influence of biochemical compounds of the leaf surface. Mededelingen Faculteit Landbouwkundige en Toegepaste Biologische Wetenschappen Universiteit Gent 61(3B): 987-997.

Notes: Study of varietal resistance, particularly the antixenotic component; 3 varieties of

cassava (*Manihot esculenta*) which are known to have different degrees of antixenotic resistance, and a weed common in cassava fields (*Talinum triangulare*) were considered; plant surface can provide information which influences the choice of the mealybug; physical and chemical features of the phylloplane were, therefore, analyzed; effect of mealybug behavior when observed on leaves unwashed, and washed with methanol.

Rensburg, L. van, Kruger, G.H.J., Ubbink, B., Scholes, M.C. & Peacock, J. 1997. A phytocentric perspective of *Asterolecanium quercicola* Bouche infestation on *Quercus robur* L. trees along an urbanization gradient. South African Journal of Botany 63: 25-31.

Notes: Diurnal courses in gas exchange, photochemical efficiency and water relations were monitored during two late summers in three groups of adult *Quercus robur* trees, planted along an urbanization gradient that correlated positively with the degree of die-back exhibited by the trees; leaf carbon:nitrogen ratios, proline and polyphenol levels were monitored to explain why the intermediate group of trees were more severely infested with *A. quercicola* (*Asterodiaspis quercicola*).

Rice, R.E., Atterholt, C.A., Delwiche, M.J. & Jones, R.A. 1997. Efficacy of mating disruption pheromones in paraffin emulsion dispensers. Bulletin OILB/SROP (Sect. Reg. Ouest Palearctique) 20: 151-161.

Notes: Technology transfer in mating disruption. Proceedings of a working group meeting in Montpellier, France, on 9-10 September 1996. Pheromones of *Grapholita molesta*, *Anarsia lineatella* and *Quadraspidiotus perniciosus*, were mixed into sprayable emulsions of water and paraffin and applied to stone fruit trees in California. Pheromone/emulsion blends were applied twice for *G. molesta* and *A. lineatella* during the 1995 season, using 49.4-76.6 g a.i./ha per application. *Q. perniciosus* pheromone was applied only once at 74 g a.i./ha. Efficacy of mating disruption was measured by pheromone or sticky traps and infested fruit. Treatments using *G. molesta* pheromone were comparable to commercial mating disruption dispensers, with no catches in monitoring traps for 8-12 weeks and a reduction of fruit infestation of 80-90%. Pheromone treatments for *A. lineatella* were less effective, with increased catches of moths in monitoring traps and no differences in infested fruit compared to untreated checks. Mating disruption of *Q. perniciosus* resulted in some reduction in crawler populations for two generations after treatment, but the cost of pheromone was prohibitive for commercial use.

Rodrigo, E., Troncho, P. & Garcia-Mari, F. 1996. Parasitoids (Hym.: Aphelinidae) of three scale insects (Hom.: Diaspididae) in a citrus grove in Valencia, Spain. Entomophaga 41: 77-94.

Notes: *Aphytis chrysomphali*, *A. melinus*, *A. lepidosaphes* and *A. hispanicus* recorded as parasitoids of *Aonidiella aurantii*, *Lepidosaphes beckii* and *Parlatoria pergandii*; rates and sites of parasitism on plant hosts estimated.

Rose, M. & Stauffer, S. 1997. 1.4.2 Laboratory and mass rearing. Pp. 297-419. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects: Their Biology, Natural Enemies and Control [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: *Saissetia oleae*, *C. hesperidum*, *Ceroplastes floridensis*, *Philephedra tuberculosa*.

- Sadof, C.S. 1997. Using biological control to manage scale insects. *Arbor Age* 17: 20, 22-24.
Notes: General, nontechnical discussions on topics such as definition of scales, why scales have so many natural enemies, assessment of scale problems, strategies for control.
- Santa-Cecilia, L.V.C., Souza, B. & Carvalho, C.F. 1997. Effects of different diets on the immature stages of *Ceraeochrysa cubana* (Hagen) (Neuroptera: Chrysopidae). (In Portuguese with summary in English). *Anais da Sociedade Entomologica do Brasil* 26: 309-314.
Notes: Larval and pupal development of the predator *Ceraeochrysa cubana* was evaluated on different diets in the laboratory at 20 plus or minus 2 deg C, 70 plus or minus 10% RH and LD 12:12. Larvae were reared on eggs of *Anagasta kuehniella* (*Ephestia kuehniella*), *Toxoptera* sp. and *Pinnaspis* sp. alone and in various combinations. In all treatments, larvae fed on *E. kuehniella* eggs had the shortest larval and pupal development, and the highest number of adults. Viability was 75, 70, 95 and 80% for treatments with eggs of *E. kuehniella*, eggs of *E. kuehniella* and *Toxoptera* sp., and eggs of *E. kuehniella* and *Pinnaspis* sp., respectively. Diets with eggs of *Toxoptera* sp. and *Pinnaspis* sp., alone and in combination, were the least suitable for development of the predator with viabilities of 0, 5 and 15%.
- Savopoulou-Soultani, M. 1997. Laboratory rearing of euonymus scale (Homoptera, Diaspididae) at different temperatures. *Journal of Economic Entomology* 90: 955-960.
Notes: Developmental rate (stage specific and total), survival, fecundity, and sex ratio of *Unaspis euonymi* (Comstock) were studied in environmental chambers maintained at 6 constant temperatures of 5, 10, 15, 20, 25, and 30 degree C. Scales were reared in the laboratory on discs cut from *Euonymus japonica* L. (Celastraceae) leaves floated on distilled water in plastic cups. Optimal temperature for development, survival, and reproduction discussed.
- Sclar, D.C. & Cranshaw, W.S. 1996a. Hawthorn insect control, Trial one, Ft. Collins, Colorado, 1995. Pp. 372 in: Burditt, A.K., Jr. (Ed.). *Arthropod Management Tests*, Vol. 21. Entomological Society of America, Lanham, MD. 462 pp.
Notes: Four treatments evaluated against *Phenacoccus dearnessi* on *Crataegus rivularis*.
- Sclar, D.C. & Cranshaw, W.S. 1996b. Control of hawthorn (two circuli) mealybug and a woolly aphid, Fort Collins, Colorado, 1995. Pp. 372-373. in: Burditt, A.K., Jr. (Ed.). *Arthropod Management Tests*, Vol. 21. Entomological Society of America, Lanham, MD. 462 pp.
Notes: Five treatments evaluated against *Phenacoccus dearnessi* and an aphid on *Crataegus arnoldiana*.
- Semyanov, V.P. 1996. Lady beetles (Coleoptera, Coccinellidae) of Leningrad region orchards (fauna, biology and their role in pest population dynamics). *Bulletin OILB/SROP* (Sect. Reg. Ouest Paelearctique) 19: 208-211.
Notes: *Chilocorus renipustulatus* and *C. bipustulatus* consumed *Lepidosaphes ulmi* on apples and *Chionaspis salicis* on apples, currants and gooseberries.
- Sether, D.M. & Hu, J.S. 1997. Transmission of pineapple closterovirus (PCV) by two species of mealy-bug. *Phytopathology* 87 (6 suppl.): S88.
Notes: [Annual meeting of the American Phytopathological Society, Rochester, New York, August 9-13, 1997.] *Dysmicoccus brevipes* and *D. neobrevipes*.

Sharaf, N.S. 1996. Importance of life tables for determining proper timing and frequency of insecticide application in controlling the spherical mealybug, *Nipaecoccus viridis* (Newstead) (Homoptera: Pseudococcidae). (In English with summary in Arabic). Dirasat. Agricultural Sciences. 23: 103-110.

Notes: Analysis of six life tables constructed for studying survival, mortality and percentage mortality of the spherical mealybug, *Nipaecoccus viridis*, on lemon indicated clearly when insecticide application(s) should be carried out.

Sharaf, N.S. 1997. Host plants and natural enemies of mealybugs and other related homopterans, with special reference to the spherical mealybug *Nipaecoccus viridis* (Newstead), in Jordan. Dirasat Agricultural Sciences 24(3): 383-390.

Notes: Field and laboratory studies were carried out in 1983/84 to identify the different species of mealybugs and other related homopterans, and to determine their host plants, economic importance and their geographical distribution in Jordan. In addition, the entomophagous complex of the spherical mealybug was determined. Four species of mealybugs (Homoptera: Pseudococcidae), the cottony-cushion scale (Homoptera: Margarodidae), the wooly apple aphid (Homoptera: Aphididae) and two species of ants (Hymenoptera: Formicidae) were identified. Of the four species of pseudococcids, the spherical mealybug *Nipaecoccus viridis* (Newstead) was the most important economic insect pest. Fifteen named species of predators, parasites and hyperparasites comprised the entomophagous complex of *N. viridis*. Discussion of the role of these natural enemies along with the two ant species in regulating the population density of *N. viridis*.

Sharma, K. K. & Ramani, R. 1997. Suitability of pumpkin (*Cucurbita moschata* Duchesne ex Poir) fruits for laboratory rearing of two strains of (Coccoidea: Tachardiidae) Indian lac insect, *Kerria lacca* (Kerr.). Journal of Entomological Research. New Delhi 21: 169-174.

Notes: The two strains i.e., rangeeni and kusmi of Indian lac insect, *Kerria lacca* (Kerr.) were successfully grown on fruits of pumpkin (*Cucurbita moschata*). Life period was favorably reduced from 184.9 and 109.6 to 154.3 and 100.9 days, respectively for kusmi and rangeeni strains. Amount of resin secreted by the insects decreased on pumpkin. The reduction was larger in kusmi (36.9%) as compared to rangeeni (27.5%). Mortality of lac insects on pumpkin was almost doubled. The insect completed its life cycle satisfactorily providing viable progeny without much effect on fertility. The two strains showed differential behaviour with respect to amount of resin secreted, mortality inflicted and total life period when cultured on pumpkin.

Sheble, D.A.F. & Kozár, F. 1996. The winter mortality and developmental biology of *Pseudaulacaspis pentagona* Targioni-Tozzetti, 1886 (Homoptera: Coccoidea). Acta Phytopathologica et Entomologica Hungarica 31: 45-51.

Notes: In the population dynamics of *P. pentagona* the winter temperature has a very important role, causing very high mortality (up to 100%); very high and dry summer temperature can also cause decline of the population.

Shirke, M.S. & Salunkhe, G.N. 1996. Biology and effect of food on adult longevity and fecundity of *Cryptolaemus montrouzieri* Mulsant a predator on mealybugs. Journal of

Maharashtra Agricultural Universities 21: 301-302.

Notes: In a laboratory study, longevity and fecundity of *Cryptolaemus montrouzieri* were greater when fed on *Maconellicoccus hirsutus* alone than when honey agar was added.

Shirke, M.S. & Salunkhe, G.N. 1996. Biology and effect of food on adult longevity and fecundity of *Cryptolaemus montrouzieri* Mulsant a predator on mealybugs. Journal of Maharashtra Agricultural Universities 21: 301-302.

Notes: *Maconellicoccus hirsutus* is a serious pest of grapevine in India.

Singh, S. 1997. Description of a new and notes on some other species of *Encyrtus* (Hymenoptera: Encyrtidae) parasitising scale insects in Assam, India. Oriental Insects. New Delhi 31: 419-426.

Notes: Hosts include *Coccus* spp. on *Terminalia chebula*, *Mangifera indica* and *Pongamia pinnata*

Smith, D., Beattie, G.A.C. & Broadley, R.H. 1997. Citrus Pests and their Natural Enemies: Integrated Pest Management in Australia. State of Queensland, Dept. of Primary Industries, and Horticultural Research and Development Corp., Brisbane, Australia. 263 + pp.

Notes: 25 scale insect species reviewed.

Souissi, R. & Le Ru, B. 1996. Effect of host plants on fecundity and development of *Apoanagyrus lopezi*, an endoparasitoid of the cassava mealybug *Phenacoccus manihoti*. Entomologia Experimentalis et Applicata 82: 235-238.

Notes: Studied effect of two *Manihot esculenta* plants, *Talinum traingulare* and a hybrid of *M. esculenta* and *M. glaziovii* on the oviposition pattern, longevity, fecundity, survival and development time of this endoparasitoid; results indicate that a direct relationship exists between the host plant and the parasitoid; host plants with a high level of antibiosis (the cassava varieties) had a deleterious effect on parasitoid survival and development.

Stadler, T., Teran, A.L., Alvarez, R. & Orlando, C. 1996. [Side effects of pesticides on *Aphytis melinus* De Bach and *A. lingnanensis* Compere (Hymenoptera: Aphelinidae), two natural enemies of diaspine scale pests on lemon trees in Tucuman province, Argentina.] (In Spanish with summary in English). Revista de Investigación (Centro de Investigaciones para la Regulación) 10: 43-49.

Notes: Original title: Efectos secundarios de plaguicidas sobre *Aphytis melinus* De Bach y *A. lingnanensis* Compere (Hymenoptera: Aphelinidae), dos enemigos naturales de Diaspididos, plagas del limonero en Tucumán, República Argentina. Using a standard bioassay technique, the side effects of sixteen pesticides in common use in lemon orchards in Tucuman were tested on adults of *Aphytis melinus* and *A. lingnanensis* (strain HK-L), two important biological control agents.

Staubli Dreyer, B., Baumgartner, J., Neuenschwander, P. & Dorn, S. 1997. The functional responses to two *Hyperaspis notata* strains to their prey, the cassava mealybug, *Phenacoccus manihoti*. Mitteilungen der Schweizerischen Entomologischen Gesellschaft 70: 21-28.

Notes: The number of prey individuals attacked by larvae and adults of the coccinellid

Hyperaspis notata (Col., Coccinellidae) as affected by the density of its prey, the cassava mealybug *Phenacoccus manihoti* (Hom., Pseudococcidae), was studied in the laboratory.

Staubli Dreyer, B., Neuenschwander, P., Baumgartner, J. & Dorn, S. 1997. Trophic influences on survival, development and reproduction of *Hyperaspis notata* (Col., Coccinellidae). *Journal of Applied Entomology* 121: 249-256.

Notes: The coccinellid *Hyperaspis notata* is associated with the mealybugs *Phenacoccus manihoti* and *P. herreni* on cassava in southern Brazil and the highlands of Colombia. Brought to Africa to help control the accidentally introduced *P. manihoti*, its range of target prey and plant food sources as well as its performance under conditions of food scarcity were investigated in the laboratory.

Staubli Dreyer, B., Neuenschwander, P., Bouyjou, B., Baumgartner, J. & Dorn, S. 1997. The influence of temperature on the life table of *Hyperaspis notata*. *Entomologia Experimentalis et Applicata* 84: 85-92.

Notes: The coccinellid *Hyperaspis notata* was introduced into Africa for the biological control of the cassava pest *Phenacoccus manihoti*. Two cohorts of strains, one originating from Southern Brazil and Paraguay feeding on *P. manihoti*, and one from Colombia feeding on *Phenacoccus herreni* were studied at different temperatures between 15 and 34 deg C and age-specific life tables were constructed. Although in the areas of origin the climatic conditions and the food sources are different, the survivorship and developmental times at the same temperature differed little among the two strains, the Colombian strain being slightly more tolerant to high temperatures. Jackknife estimates of the intrinsic rates of increase (rm) peaked very close to 30 deg C for the two strains.

Stauffer, S. & Rose, M. 1997. 3.2.2 Biological control of soft scale insects in interior plantscapes in the USA. Pp. 183-205. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Discusses differences of interior plantscapes from other crops under protected cultivation; comparison of pests of interior plantscapes with those of other protected cultivations; standard controls compared to biological controls; pest identification and the status of key pests; education of interior plantscape managers; natural enemies; common coccid pests include *Ceroplastes cirripediformis*, *C. floridensis*, *Chloropulvinaria psidii*, *Coccus hesperidum*, *C. longulus*, *Eucalymnatus tessellatus*, *Parasaissetia nigra*, *Philephedra tuberculosa*, *Saissetia coffeae*, *S. miranda*, *S. neglecta* and *S. oleae*.

Stimmel, J.F. 1997. Fern scale, *Pinnaspis aspidistrae* (Signoret) Homoptera: Diaspididae. *Regulatory Horticulture* (Pa. Dept. of Agric.) 23: 29-30.

Notes: Distribution; identification; life history; damage and economic importance; chemical control.

Subbarayudu, B. & Ram, R.L. 1997. Distribution of host plants of the lac insect, *Kerria lacca* (Kerr.). *Journal of Entomological Research*. New Delhi 21: 187-192.

Notes: A survey of the host plants of the Indian lac insect, *Kerria lacca*, was carried out

- during 1995-96 in Bihar, India. The survey showed that host plants belonged to 32 genera and 53 species.
- Sugimoto, S., Kadoi, M. & Tasaka, E. 1996. Miscellaneous notes on the scale insects (Homoptera: Coccoidea) intercepted at quarantine inspection on bananas. (In Japanese with summary in English). Research Bulletin of the Plant Protection Service Japan 32: 99-101.
Notes: Species discussed include *Dysmicoccus bispinosus*, *D. neobrevipes*, *D. brevipes*, *Planococcus minor*, *Pseudaulacapsis* (*Pseudaulacaspis*?) *cockerelli*, *Lepidosaphes laterochitinsa*, *Aspidiotus destructor*, *Abgrallaspis cyanophylli*, *Hemiberlesia* (*Abgrallaspis*) *musae* and *H. ocellata*.
- Sugonyaev, E.S. 1996. Ants nesting on living plants in the tropics as refuges for soft-scale insects (Homoptera, Coccidae), protecting them from attacks of Chalcidoid parasites (Hymenoptera, Chalcidoidea). Entomological Review 75: 120-127.
Notes: [Originally published in Zoologicheskii Zhurnal, 1995, 74(3): 80-87.] Description of this mutualistic arrangement; ants eat honeydew food of coccids, while coccids find protection from attacks by parasites and cleaning of excrement, creating favorable conditions for reproduction; chalcidoid parasites can infest up to 20% of scales; discussion of types of nests; associated species observed include *Coccus formicarii* in nests of *Crematogaster dohrni*, *Coccus viridis* visited by *Anoplolepis longipes*, *Saissetia zanzibarensis* in leaf nests of *Oecophylla longinoda*, *Coccus hesperidum* being transferred from dying leaves to green leaves by *Oecophylla smaragdina*, *Coccus viridis* being transferred by *Solenopsis geminata* and *Crematogaster brevinosa*, removal of dead individuals of *Coccus formicarii* by *Crematogaster dohrni* from shelters built on persimmon, *Iridomyrmex humilis* seen protecting *Saissetia oleae* from *Metaphycus helvolus* and others.
- Sugonyaev, E.S. 1996a. [Chalcid wasps (Hymenoptera, Chalcidoidea) parasites on soft scales (Coccinea, Coccidae) in Vietnam. 3. Two new species of the genus *Coccophagus* Westwood. (In Russian). Entomologicheskoe Obozrenye 75: 169-171, 226.
Notes: Host is *Saissetia coffeae*.
- Sugonyaev, E.S. 1996b. [Chalcid wasps (Hymenoptera, Chalcidoidea) parasites on soft scales (Homoptera, Coccidae) in Vietnam, 4. New species of the genera *Microterys* Thomson and *Metaphycus* Mercet (Encyrtidae), partly inhabiting ants' nests, with morphological notes.] (In Russian). Entomologicheskoe Obozrenye 75: 417-483.
Notes: [Abstract only.] Host species mentioned include *Eucalymnatus tessellatus* and *Ceroplastes ceriferus*.
- Sun, J., DeBarr, G.L., Liu, T.X., Berisford, C.W. & Clarke, S.R. 1996. An unwelcome guest in China, a pine-feeding mealybug. Journal of Forestry 94: 27-32.
Notes: *Oracella acuta* on *Pinus elliotii*.
- Sushil, S. N.; Mishra, Y. D.; Bhattacharya, A.; Jaiswal, A. K.; Sharma, 1997. Safety of endosulfan and dichlorvos to four parasitoids of lac insect predators. Pest Management in Horticultural Ecosystems 3: 39-41.
Notes: The toxicity of endosulfan and dichlorvos to *Pristomerus sulci*, *Brachymeria tachardiae*, *Elasmus claripennis* and *Bracon greeni* was studied in the laboratory. These species are parasitoids of *Pseudohypatopa pulverea* and *Eublemma amabilis*.

which are predators of *Kerria lacca*. One-day-old adult parasitoids were introduced to treated glass vials at 25 plus or minus 2 deg C and 70-75% RH. Endosulfan (0.05%) was toxic to all the parasitoids tested, causing up to 100% mortality within 1 h. Dichlorvos (0.03%) was less toxic, but mortality after 24 h varied from 16.6% for *B. greeni* to 76.6% for *E. claripennis*.

Swift, S.F. 1997. First records of mites in the family Eupalopsellidae (Acari: Prostigmata: Raphignathoidea) in the Hawaiian Islands. Bishop Museum Occasional Papers 49: 39-41.

Notes: *Exothorhis caudata* and *Saniosulus nudus* are reported as new to the fauna of Hawaii. Both species are predators of scale insects and are therefore potential biological control agents of these pests.

Swirski, E., Ben-Dov, Y. & Wysoki, M. 1997. 3.3.4 Mango. Pp. 241-254. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Notes on the important mango pests: *Ceroplastes actiniformis*, *C. floridensis*, *C. pseudoceriferus*, *C. rubens*, *C. sinensis*, *Chloropulvinaria psidii*, *Coccus hesperidum*, *C. viridis*, *Eucalymnatus tessellatus*, *Kilifia acuminata*, *Milviscutulus mangiferae*, *Protopulvinaria pyriformis*, *Pulvinaria polygonata* and *Vinsonia stellifera*; table shows 63 scale species recorded on mango with distribution and references.

Swirski, E., Ben-Dov, Y. & Wysoki, M. 1997a. 3.3.5 Guava. Pp. 255-263. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Notes on main pests: *Ceroplastes destructor*, *C. psidii*, *Chloropulvinaria floccifera*, *C. psidii*, *Coccus hesperidum*, *Parasaissetia nigra*, *Protopulvinaria pyriformis* and *Saissetia coffeae*; additional scale species recorded on guava listed in table with distributions and references.

Swirski, E., Ben-Dov, Y. & Wysoki, M. 1997b. 3.3.6 Persimmon. Pp. 265-270. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Notes on scale pests, *Ceroplastes cirripediformis*, *C. japonicus*, *C. pseudoceriferus*, *C. rubens*, *C. sinensis*, *Coccus hesperidum* and *Parthenolecanium persicae*; 38 species recorded on *Diospyros* spp. listed in table with geographical distribution.

Swirski, E., Ben-Dov, Y. and Wysoki, M. 1997c. 3.3.7 Other subtropical fruit trees. Pp. 271-292. in: Ben-Dov, Y. & Hodgson, C.J., Eds. Soft Scale Insects - Their Biology, Natural Enemies and Control [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.

Notes: Notes on scale species, *Ceroplastes floridensis*, *C. japonicus*, *C. pseudoceriferus*, *C. rubens*, *C. sinensis*, *Chloropulvinaria floccifera*, *C. psidii*, *Coccus hesperidum*, *C. longulus*, *Cribrolecanium andersoni*, *Eucalymnatus tessellatus*, *Milviscutulus mangiferae*, *Parasaissetia nigra*, *Philephedra tuberculosa*, *Pulvinaria aurantii*, *P. hydrangeae*, *P. polygonata*, *Saissetia coffeae*, *S. oleae* and *Parthenolecanium corni*; hosts; table of other species recorded on various subtropical fruits trees with hosts, distributions and references.

- Swirski, E., Wysoki, M. & Ben-Dov, Y. 1997. 3.3.3 Avocado. Pp. 231-239. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Notes on pests, include *Ceroplastes ceriferus*, *C. cirripediformis*, *C. destructor*, *C. floridensis*, *C. sinensis*, *Coccus hesperidum*, *Parthenolecanium corni*, *Protopulvinaria pyriformis*, *Saissetia coffeae* and *S. oleae*. Other species mentioned in table with distributions and references.
- Szklarzewicz, T. 1997. Structure and development of the telotrophic ovariole in ensign scale insects (Hemiptera, Coccoomorpha, Ortheziidae). *Tissue and Cell* 29: 31-38.
- Notes: The paired ovaries of young larvae of the 3rd instar of *Orthezia urticae* are filled with numerous germ cell clusters that can be regarded as ovariole anlagen. Germ cells (cystocytes) belonging to one cluster form a rosette, in the centre of which a polyfusome occurs. Staining with rhodamine-phalloidin has revealed that polyfusomes contain numerous microfilaments. The number of cystocytes per cluster is not stable and varies considerably. The ovaries of older larva become elongated with numerous young ovarioles protruding into the body cavity. The ovarioles are not subdivided into the tropharium and vitellarium. In this stage germ cells differentiate into oocytes and trophocytes (nurse cells). The ovaries of adult females are composed of about 20 (*Newsteadia floccosa*) or 30 (*O. urticae*) ovarioles. Their trophic chambers contain trophocytes and arrested oocytes. In the vitellarium, at the given moment, only one oocyte develops. It has been observed that after maturation of the first egg the arrested oocytes may develop.
- Takagi, S. 1997. Further material of *Conchaspis* from southeast Asia (Homoptera: Coccoidea: Conchaspidae). *Insecta Matsumurana* 53: 27-79.
- Notes: *Conchaspis angraeci*, *C. buchananiae*, *C. vaccinii*, *C. garciniae* and *C. socialis* revised; key to adult females and larvae; importance of ontogenetic approach and functional morphology in systematics is emphasized.
- Takagi, S. 1997a. Further forms for the Rugaspidiotini-problem III: *Pygalataspis miscanthi* (Homoptera: Coccoidea: Diaspididae). *Insecta Matsumurana* 53: 100-105.
- Notes: Description of first instar; material collected in Kowloon Peninsula, Hong Kong, on *Miscanthus* sp.; comparisons; illustrations.
- Takagi, S. 1997b. Further forms for the Rugaspidiotini-problem IV: an Odonaspidine-patterned form from Malaya (Homoptera: Coccoidea: Diaspididae). *Insecta Matsumurana* 53: 105-116.
- Notes: Description of *Roureaspis dungunensis*; recorded on underside of leaf of *Rourea rugosa*; illustrated.
- Takagi, S., Marusik, Y.M., Ohara, M. & Urbain, B.K. 1997. Records of *Arctorthezia cataphracta* from the Middle Kuril Islands and SEM observations of their wax-secreting organs (Homoptera: Coccoidea: Ortheziidae). (In Japanese with summary in English). *Bulletin of the Otaru Museum* 10: 1-7.
- Notes: This species recorded for the first time in the Kuril Islands; found on grasses such as *Carex* spp. and *Calamagrostis langsdorfi*; illustrated with 10 photomicrographs.

- Takagi, S., Tang, F.T., Yasar, B. & Kondo, T. 1997. Further forms for the Rugaspidiotini-problem (Homoptera: Coccoidea: Diaspididae). *Insecta Matsumurana* 53: 81-99.
Notes: *Adiscodiaspis tamaricicola*, *Prodiaspis tamaricicola* and *Circodiaspis sinensis*, all associated with tamarisks, are rearranged to *Prodiaspis sinensis* and *P. tamaricicola*; descriptions; illustrations.
- Tamaki, Y. 1997. 1.1.2.5 Chemistry of the Test Cover. Pp. 55-72. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 55-72.
Notes: Covers relative weight of the test or cover, composition of the waxy materials, composition of body lipids, composition of the aqueous materials, and mode of secretion. Species mentioned include *Aonidiella aurantii*, *Asterococcus muratae*, *Callococcus acaciae*, *Chrysomphalus aonidum*, *Ceroplastes albolineatus*, *C. ceriferus*, *C. destructor*, *C. japonicus*, *C. rubens*, *C. pseudoceriferus*, *Dactylopius coccus*, *D. confusus*, *Drosicha corpulenta*, *Ericerus pela*, *Eulecanium cerasorum*, *Icerya purchasi*, *Kermes ilicis*, *Kerria lacca*, *Lecanodiaspis quercus*, *Parthenolecanium corni*, *Pseudaulacaspis pentagona*, *Pseudococcus comstocki*, *Pulvinaria horii*, *Unaspis eunonymi*, *U. yanonensis*, and *Tachardina theae*.
- Tang, F.T., Wu, S. & Li, Huiping 1997. A discussion on the type species of the genus *Matsucoccus* with *Sonsaucoccus* as its new synonym (Homoptera: Margarodidae). (In English with summary in Chinese). *Entomotaxonomia* 19: 17-23.
Notes: Revision of the genus *Matsucoccus*. Due to the imperfect original description, types preserved and redescribed by Herbert (1921) and Morrison (1928) in USA were excessively trusted. Moreover, the Japanese fauna of the genus is considered to be simple and represented only by this species, but a recent study expresses that there are 2 species even in original description of Kuwana in Japan: one with larger size and damaging to black pine; the other with smaller size and damaging to red pine. They may be named the black pine bast scale and the red pine bast scale separately. After a study and revision on related literatures, we found that black pine bast scale is the real *M. matsumurae* (= *M. thunbergianae* Miller et Park, 1987) fitting the description of the holotype; the red pine bast scale is the so-called '*M. matsumurae*' in the past, which may be the species *liaoningensis* Tang (1978) or *resinosae* Bean et Godwin (1955). The genus *Sonsaucoccus* Young (1980) is treated as a junior synonym of the genus *Matsucoccus*. Key to the Palaearctic species of the genus is made.
- Thomson, K.G., Dietzgen, R.G., Thomas, J.E. & Teakle, D.S. 1996. Detection of pineapple bacilliform virus using the polymerase chain reaction. *Annals of Applied Biology* 129: 57-69.
Notes: Adult and juvenile pineapple mealybugs, *Dysmicoccus brevipes* were collected from PBV-infected pineapples, and *Planococcus citri* was collected from glasshouse-grown uninfected banana.
- Tremblay, E. 1997. 1.2.1.2 Embryonic development; oviparity and viviparity. Pp. 257-260. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

- Notes: Species mentioned include *Sphaerolecanium prunastri*, *Pulvinaria vitis*, *Coccus hesperidum*, *Toumeyella pinicola*, *T. liriodendri*, *Saissetia* spp., *Parthenolecanium* spp., *Quadraspidotus* spp., and *Pseudaulacaspis* spp.
- Tremblay, E. 1997a. 1.2.1.3 Endosymbionts. Pp. 261-267. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.
- Notes: Topics include morphology, nature, localization, host regulation and significance; list of Coccidae symbionts for which information is available are *Ceroplastes rusci*, *Chloropulvinaria floccifera*, *C. psidii*, *Coccus hesperidum*, *C. longulus*, *Eucalymnatus tessellatus*, *E. kunoense*, *E. tiliae*, *Lecanium* sp., *Neopulvinaria innumerabilis*, *Parasaissetia nigra*, *Parthenolecanium cerasifex*, *P. corni*, *P. persicae*, *P. putnami*, *Physokermes piceae*, *Pulvinariella mesembryanthemi*, *Pulvinaria vitis*, *Saissetia coffeae*, *S. oleae* and *Sphaerolecanium prunastri*.
- Van Baaren, J., Barbier, R. & Nenon, J.P. 1996. Female antennal sensilla of *Epidinocarsis lopezi* and *Leptomastix dactylopii* (Hymenoptera: Encyrtidae), parasitoids of pseudococcid mealybugs. (In English with summary in French). *Canadian Journal of Zoology* 74: 710-720.
- Notes: *Epidinocarsis lopezi* was introduced into sub-Saharan Africa to control the cassava mealybug, *Phenacoccus manihoti*, and *Leptomastix dactylopii* was introduced into various countries to control *Planococcus citri*.
- Varshney, R.K. 1996. Scale insects and mealybugs in the Indian Thar Desert. Pp. 185-189. in: Ghosh, A.K., Baqri, Q.H. & Prakash, I. *Faunal Diversity in the Thar Desert: Gaps in Research*. Scientific Publishers, Jodhpur, India. 410 pp.
- Notes: Species listed include *Icerya pilosa*, *Drosicha dalbergiae*, *D. mangiferae*, *D. stebbingi*, *Hemaspidoproctus cinereus*, *Kerria chamberlini*, *K. fici*, *K. lacca*, *Dactylopius tomentosus*, *D. indicus*, *Birendracoccus saccharifolii*, *Coccidohystrix* sp., *C. insolita*, *Naiacoccus serpentinus*, *Nipaecoccus* sp., *N. viridis*, *Rastrococcus iceryoides*, *Maconellicoccus hirsutus*, *Planococcoides robustus*, *Saccharicoccus sacchari*, *Ceroplastes actiniformis*, *C. ajmerensis*, *Ceroplastodes cajani*, *Coccus hesperidum* and *Macropulvinaria maxima*.
- Varshney, R.K. 1994. Insecta: Homoptera: Coccoidea. State Fauna Series: Fauna of West Bengal Part 5: 319-367.
- Notes: [This paper actually issued in 1996]; report of 107 species in 64 genera and 11 families; general morphology; key to families; economic importance; synonymy; host plants; distribution.
- Verghese, A. 1997. Effect of neem on first instar crawlers of mealybug, *Maconellicoccus hirsutus* Green. *Insect Environment* 2: 121-122.
- Notes: The effects of 5 and 2.5% neem seed extracts and azadirachtin (Econeem) at 9 p.p.m. on newly-hatched and late 1st-instar (4-day-old) nymphs of *Maconellicoccus hirsutus* were studied in the laboratory. After 24 and 48 h, mortality of early 1st-instar nymphs was greatest with 5% neem seed extracts. For late 1st-instar nymphs, mortality after 24 and 48 h was greatest with 9 p.p.m. azadirachtin.

- Verghese, A. 1997a. Colony number, size and reproductive potential of the grape mealybug, *Maconellicoccus hirsutus* (Green) on laboratory host, pumpkin. *Insect Environment* 2: 139-140.
- Notes: The colony number and size of settled nymphs of *Maconellicoccus hirsutus* were studied on pumpkin (*Cucurbita moschata*) in the laboratory. The mean number of pseudococcids per colony was 81, 47, 22.83 and 13.3 during the 1st, 2nd, 3rd and 4th weeks, resp., with mean colony diameters of 0.95, 0.98, 1.16 and 1.40 mm.
- Viggiani, G. 1996. Notes on *Mayrencyrtus merceti* Hoffer (Hymenoptera: Encyrtidae), parasitoid of *Kuwania rubra* Goux (Homoptera: Margarodidae). *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'*. Portici 52: 101-103.
- Notes: Longevity; oviposition behaviour; rate of parasitism and natural enemies.
- Viggiani, G. 1996a. [Morpho-biological notes on *Microterys dichrous* (Mercet) (Hymenoptera: Encyrtidae), parasitoid of *Nidularia pulvinata* Planchon (Homoptera: Kermesidae).] Note morfo-biologiche sul *Microterys dichrous* (Mercet), parassitoide di *Nidularia pulvinata*. (In Italian with summary in English). *Bollettino del Laboratorio di Entomologia Agraria 'Filippo Silvestri'*. Portici 52: 105-109.
- Notes: *Microterys dichrous* (Mercet) has been found a common natural enemy of *Nidularia pulvinata* Planchon in southern Italy. Morpho-biological notes are given on the adult and some young stages of the parasitoid.
- Viggiani, G. 1997. 2.3.3 Eulophidae, Pteromalidae, Eupelmidae and Signiphoridae. Pp. 147-158. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects - Their Biology, Natural Enemies and Control* [Vol. 7B]. Elsevier, Amsterdam & New York. 442 pp.
- Notes: Soft scale hosts include *Ceroplastes cirripediformis*, *Coccus viridis*, *Eulecanium rugulosum*, *E. sibiricus*, *E. tiliae*, *Mesolecanium nigrofasciatum*, *Parthenolecanium corni*, *Physokermes hemicryphus*, *Rhodococcus turanicus*, *Saissetia oleae* and *Sphaerolecanium prunastri*.
- Viggiani, G. & Liotta, G. 1997(1989). [On the introduction in Italy of *Encarsia herndoni*, parasitoid of *Insulaspis gloverii* - preliminary notes.] Sull'introduzione in Italia della *Encarsia herndoni* parassitoide di *Insulaspis gloverii* (Homoptera: Diaspididae) - notizie preliminari. *Phytophaga*. Palermo 3: 79-81.
- Notes: The aphelinid *Encarsia herndoni*, a specific parasitoid of *Insulaspis gloverii* (*Lepidosaphes gloverii*), was introduced into southern Italy from Spain in 1988. The parasitoid was recovered in 1989 in Sicily.
- Vranjic, J.A. 1997. 1.3 Ecology. 1.3.1 Effects on host plant. Pp. 323-336. *in*: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 323-336.
- Notes: Topics are feeding damage, resource removal, contamination with honeydew and sooty moulds, associations with plant pathogens, photosynthesis and gas exchange, water relations, nutrient content, shoot growth, root growth, flower and fruit production, architecture and allocation, host plant condition, insect population density, ant attendance and recommendations for future research; species mentioned include *Ceroplastes destructor*, *C. sinensis*, *Chionaspis pinifoliae*, *Cissococcus fulleri*, *Coccus viridis*, *Cribrolecanium andersoni*, *Cryptococcus*

fagisuga, *Dactylopius confusus*, *Eriococcus confusus*, *E. coriaceus*, *Eulecanium tiliae*, *Fiorinia externa*, *Icerya seychellarum*, *Illinoia liriodendri*, *Matsucoccus acalyptus*, *M. feytaudi*, *M. paucicatricis*, *Megapulvinaria maskelli*, *Nothofagus solandri*, *Nuculaspis tsugae*, *Pseudaulacaspis pentagona*, *Pulvinaria regalis*, *Pulvinariella mesembryanthemi*, *Toumeyella liriodendri*, *T. parvicornis*, *Ultracoelostoma assimile* and *Unaspis euonymi*.

Vranjic, J.A. & Ash, J.E. 1997. Scale insects consistently affect roots more than shoots: the impact of infestation size on growth of eucalypt seedlings. *Journal of Ecology* 85: 143-149.

Notes: Different infestation levels of the phloem-feeding scale insect, *Eriococcus coriaceus*, consistently reduced root growth more than shoot growth in seedlings of *Eucalyptus blakelyi*.

Watanabe, H., Watanabe, T., Kitahara, T. & Mori, K. 1997. Concise synthesis of a racemic and diastereomeric mixture of the sex pheromones of *Matsucoccus* pine scales. *Biosciences, Biotechnology and Biochemistry* 61: 127-130.

Notes: A short (3-5 steps) synthesis of a racemic and diastereomeric mixture of *Matsucoccus* sex pheromones is described. The key reaction is Lewis acid-mediated cyanation of symmetric tertiary alcohol 6 to afford common intermediate 7.

Wharton, P. & Chesney, P. 1996. The 'scarlet tip condition' in cultivated pineapple in Guyana. (In English with summaries in French & Spanish). *Tropical Agriculture* No. 19: 77-8.

Notes: Mealybugs associated with this condition includes *Dysmicoccus brevipes*.

Whiting, D.C. & Hoy, L.E. 1997. High-temperature controlled atmosphere and air treatments to control obscure mealybug (Hemiptera: Pseudococcidae) on apples. *Journal of Economic Entomology* 90: 546-550.

Notes: *Pseudococcus affinis*, obscure mealybug, life stages infesting apples.

Wiles, G.J., Schreiner, I.H., Nafus, D., Jurgenson, L.K. & Manglona, J.C. 1996. The status, biology, and conservation of *Serianthes nelsonii* (Fabaceae), an endangered Micronesia tree. *Biological Conservation* 76: 229-9.

Notes: Three species of mealybugs appear to be most damaging to *S. nelsonii* on Guam, but are not yet a problem on Rota: *Dysmicoccus neobrevipes*, *D. brevipes* and *Planococcus citri*.

Williams, M.L. 1997. 1.1.2.3 The immature stages. Pp. 31-48. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: General characteristics; first, second and third instars, male and female; fourth instar male; slide-mounted specimens; table of 118 species listed with references to descriptions of immature stages in literature.

Williams, M.L. & Hodges, G.S. 1997. 1.1.3.3 Taxonomic characters: nymphs. Pp. 143-156. in: Ben-Dov, Y. & Hodgson, C.J., Eds. *Soft Scale Insects: Their Biology, Natural Enemies and Control* [Vol. 7A]. Elsevier, Amsterdam & New York. 452 pp.

Notes: Includes table of character measurements of 52 species.

Wu, S., Jia, C. & Tang, F. 1996. Two new species of the genus *Heliococcus* Sulc (Homoptera: Coccoidea: Pseudococcidae) from Shanxi, China. (In English with summary in Chinese). *Entomotaxonomia* 18: 257-260.

Notes: *Heliococcus acirculus* and *H. medicagicola* described and illustrated.

Xu, Z.H. & He, J.H. 1997. Two new species of the genus *Anicetus* from China (Hymenoptera: Encyrtidae). (In Chinese with summary in English). *Acta Zootaxonomica Sinica* 22: 90-94.

Notes: *Anicetus rubensi* sp. nov. is described, from specimens reared from the host *Ceroplastes rubens* from China. *Anicetus rarisetus* sp. nov. is described from *C. rubens*, *C. japonicus* and *C. ceriferus* from China.

Yi, J. 1997. Studies on the biology of *Chilocorus bijugus* Mulsant. (In Chinese with summary in English). *Natural Enemies of Insects* 19: 59-61.

Notes: The lady beetle, *Chilocorus bijugus*, is an important predacious natural enemy of white wax scale, *Ericerus pela*. It has one generation per year in Ligustrum woods in Kunming, Yunnan, China. The mean developmental periods and hybernation are given.

Ziegler, R., Engler, D.L., Bartnek, F., Van Antwerpen, R., Bluestein, H.A., Gilkey, J.C. & Yepiz, G. 1996. A new type of highly polymerized yolk protein from the cochineal insect *Dactylopius confusus*. *Archives of Insect Biochemistry and Physiology* 31: 273-287.

Notes: A female specific protein was isolated from eggs and female hemolymph of cochineal insects, using density gradient ultracentrifugation, ammonium sulfate precipitation, and size exclusion column chromatography; this newly identified protein is the major yolk protein of *D. confusus*, and appears to be unique both in its subunit structure and in its polymerizing qualities.

